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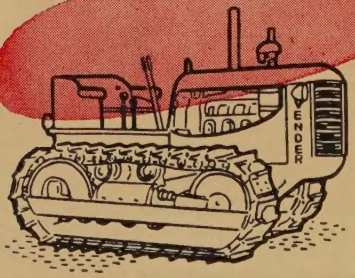

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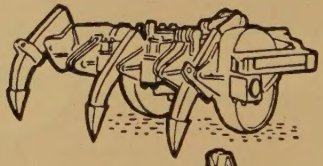

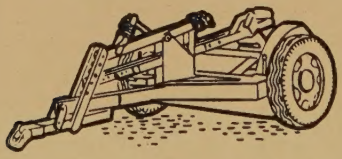

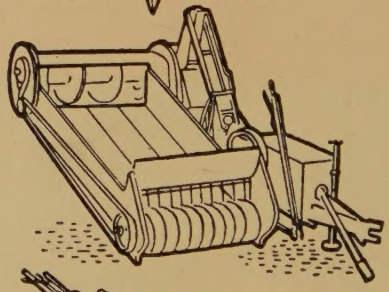

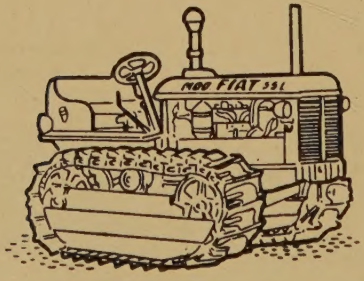

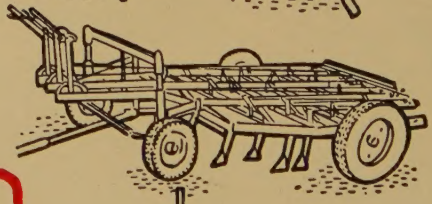

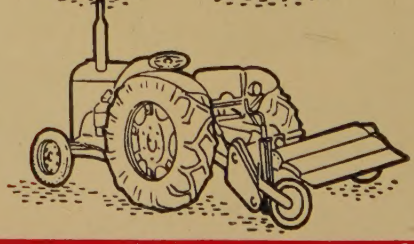

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WESTERN AUSTRALIA

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FOREWORD

By A. L. McKENZIE CLARK, L.V.Sc., DEPUTY DIRECTOR OF AGRICULTURE

THE soil is a nation's heritage —a rich legacy from past generations of pioneers who laboured and endured hardships in order that the land should produce for the nourishment and clothing of mankind.

We must use this legacy to the fullest extent without exploiting it. We must, by sound farming methods, ensure that the soil not only provides for the needs of our people today but is left in a condition which will enable it to yield still more generously for generations yet unborn.

THE DEPUTY DIRECTOR OF AGRICULTURE

Today the world is short of food, for many countries have populations whose needs cannot be met by the areas of arable land within their borders. Here in Australia, where our land is sufficient to provide for a much greater population than we yet possess, we can help to narrow the gap that yawns between world food production and world needs.

The Department of Agriculture is organised to provide the farming community with a technical service designed to maintain and increase food production. New methods of land development have been studied on existing properties and investigations are being carried out to establish sound farming methods on formerly unproductive soils.

Outstanding advances have already been made — advances which could not have been achieved without the co-operation of many farmers. Such men have been appreciative of the services rendered by scientific research into their problems and have implemented, by their practical experience, the lessons learnt through research.

Only when such co-operation is forthcoming from all farmers will the maximum production target be reached. The universal application of proved sound farming practices will bring increased yields per acre and per animal. This will enable us to lift food production in this State, and Australia as a whole, to meet the demands of our increasing population and maintain surpluses for export to other lands.

We cannot disregard the call for greater food production. The Department of Agriculture, through its technical officers is ever ready to point the way to an increase in output that will ensure individual and national economic stability. The Department is here to serve YOU as it has served others. Take full advantage of the help and advice which is available and by your own personal efforts assist your fellow-producers to lift the State's average of rural production.

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TRAINING A SHEEP DOG

Some Hints for Beginners

By E. G. RILEY

AN untrained sheep dog pup doesn't cost very much, even in these days of inflated prices, but when he is properly trained he will perform in a few minutes, work that ten men could not accomplish in as many hours. That is a point worth remembering when training a dog—you are developing an asset, that will save you a hundred times his cost in time and temper—so it is well worth your while to train him properly.

Mr. E. G. Riley, of Gingin, the author of this article is an outstanding breeder and trainer of sheep dogs with the unique distinction of having held the State Sheep Dog Championship on four occasions. His dogs gained first and second places in last year's championship trials at the Royal Show. Apart from successes on the trial course, Mr. Riley has had considerable experience of station work and droving and his knowledge and understanding of dogs is put to good effect when, as a Vermin Control Officer of the Department of Agriculture, he has to pit his wits against the cunning of sheep-killing wild dogs.

Every man is not temperamentally suited to the training of a sheep dog—otherwise there would be far more really good dogs about—so first ask yourself whether you are capable of handling the job.

For a start, you must like and understand dogs. You must possess unlimited patience and lots of self-control for if you can't control yourself you have little hope of being able to control a dog.

It isn't always easy to control your temper—I know because I sometimes lose mine—but a lost temper can mean

a pup spoilt or at best a long time spent in eradicating the memory of that one mistake.

If you can't be reasonably certain of controlling your temper, don't waste time trying to train a pup. Buy yourself a ready-trained dog or at least one that is broken in to the rudiments of working sheep.

CHOOSING THE PUP

When you have convinced yourself that you have at least a sporting chance of becoming a successful trainer you can commence looking round for the prospective pupil.

Here in Western Australia, you will be limited to a choice of two breeds, the kelpie or the Border collie. I have bred and trained good dogs of both breds but all my dogs today are Border collies. I like the collies because, for one thing, there are more good strains available—and strain is far more important than breed.

Whatever breed you fancy, make sure that your pup is descended from good working stock, for the instinct to work is bred into these dogs. A pup who has never seen sheep will often be found rounding up the fowls almost as soon as he can walk.

If your dog's sire and dam, and his grandsires and grand-dams were good workers, able to stand up to hard wear and tear, there is a good chance of the qualities appearing in your pup.

Naturally, if you have the choice of a litter, pick the pup that appeals to your fancy. The head is a good indication of quality, and your pup should be bright-eyed, keen and alert, the sort of pup that takes an intelligent interest in everything that moves. Of course he should be well-built with sound legs and good feet.

PRELIMINARY TRAINING

There are no hard-and-fast rules for training a dog. Pups are individuals, just like human beings, and the methods that suit one pup may be useless with another. Some learn their lessons easily—and forget them just as quickly. Some are slow to learn but apparently have more retentive memories. Some are nervous and highly-strung while others are "tough guys".

All need different handling and half the art of training a dog is being able to recognise the temperament and adapt your teaching methods accordingly.

I have often been asked at what age a pup's training should commence. There are many different ideas on this subject but I like to get busy as soon as the pup is weaned, say at nine or ten weeks of age. At that age, many of the early lessons can be made into a game which the pup will enjoy.

First give your pup a name and use it often. Preferably the name should be something short and distinct, different in sound from the names of any other dogs on the place so that there will be no confusion. It should be a name that carries well when shouted, so that he can be recalled easily when working at a distance.

DON'T shout at the pup at this stage, however, or you are liable to reduce him to a scared bundle of fur. Speak to him quietly and kindly and talk to him con-

stantly so that he gets confidence in you. Call him by name at all times so that he learns to answer to it promptly. Never hit him or apply any form of punishment—your voice is sufficient to let him know he is doing wrong, or to let him know he is doing right. Always be generous with praise when he does the right thing and your pup will soon be anxious to please.

Tie him up to get him used to being on the chain and then take him for walks on the chain or lead. When he will walk freely on the lead, carry a stick and hold it in front of him if he comes alongside you or tries to run ahead. Say "Heel" or "Get behind" each time you check him and he will soon learn to follow at heel wherever you go. Don't keep him tied up but let him run around and develop his body and mind.

TEACHING TO SIT

When he has learnt to follow at heel, hold the lead in the left hand and press him down to a sitting position with the right, saying "Sit" each time as you press him down.

Don't make the lessons too long, not more than about five minutes twice a day for a start.

Persevere with the sitting lesson, until he will sit down on command without being pressed down. At this stage accompany the command, "Sit", with a downward motion of the hand and he will gradually learn to sit when the signal is given, even if you don't speak.

Now move away to the full length of the chain and keep the pup sitting. Check any tendency to move at this stage, until you call him to you.

When he will sit on command or signal and stay down until called to you, put him on a light cord and continue the same lessons but at greater distances. Lengthen the cord to 25 or 30 yards and persevere with short lessons until eventually you can sit him down, walk away from him to any distance up to the full length of the cord, and then call him to you.

Don't rush this training for it is the basis of most good sheep dog work. If your dog will sit on command and return to you immediately he is called or signalled, he is more than half trained. At least you can check him whenever he does the wrong thing.

Never give your dog lessons off the cord until the habit of prompt obedience is second nature to him. If he refuses to sit, or runs away from you, and the

cord is not there to check him, the chances are that he is finished as far as really good work is concerned.

You now have a dog who will sit on command and come to you when ordered. Sit him down, walk away then call him to you but sit him down again before he has covered the distance. Practise this and get him used to stopping and moving in response to both commands and signals.

At this stage too, check any tendency to dash about at high speed, especially when coming to you. Check him by saying "Steady!" and holding up your hand until you can slow him down or stop him without actually sitting him down.

The actual words of the command don't matter, in fact many trainers work entirely by whistle signals, but always use the same command for each movement and always accompany it by the appropriate hand signal so that he gets his orders by eye as well as ear.

When you call him to you, always move away from him so that he gets into the habit of coming in behind you.

SENDING HIM OUT

The next lesson—still on the cord—is to teach the pup to run out on command. This may be a trifle difficult and will call for lots of patience.

With the pup at heel, sweep your arm outward and say "Go" or "Get out" or any suitable order. At the same time move away from him and backward to give him the idea. You may even find it necessary to run out with him at first, but persevere until he will run out to right or left when ordered. Insist on every run commencing from the "Heel" position.

If he still cannot get the idea of running out on command, don't lose your temper with him, but take him into a paddock where there are a few sheep. He will usually want to run after the sheep, and will soon get the idea.

If he doesn't go out wide enough, run with him and say "Keep out," waving him away all the time till he is at the full length of the cord.

Check him immediately if he tries to cross in front of you, for "crossing the cast" is an unforgiveable crime in sheep dog trial work, and you may want to enter him in a trial some day.

WORKING WITH SHEEP

Up till now, you will have noticed that I have hardly mentioned sheep. Don't take the pup out to work sheep until he has enough pace to "head" his sheep satisfactorily, or you may spoil a good pup. Some may be ready at five to six months, others may take longer.

WELL-BALANCED: In this photograph, Mr. Riley is shown working three sheep with three dogs. Note the perfect balance, with the sheep brought almost to the feet of the man, and all three dogs alert to check any attempt at a breakaway.

When you are satisfied that he will obey you every time, even when not on the cord—when he will run out, stop, sit and come to you as ordered, and has learnt the meaning of "Steady!"—you can try him out with sheep.

Have a quiet mob of 20 or 30 sheep in a small paddock. They will be all the better for having been "steadied down" previously by an older dog.

Start close to the sheep to lessen the chances of him crossing his cast, and send out your pup to a flank, making him start his run from the "Heel" position. Walk towards the sheep yourself and try to get him to go well round behind the sheep. Don't sit him down on his first lessons with sheep or you may find it difficult to lift him again.

If he tries to run right round the sheep in a circle, run round them yourself in the other direction and check him, then send him back in the opposite direction.

ENCOURAGE THE PUPIL

On a young dog's first run with sheep do not insist on any standards of perfection. Short of biting a sheep, let him do almost anything he likes, otherwise you may confuse him and make him unwilling to approach the sheep. Give him all the encouragement you can.

Later, try to get him to run out wide to a flank and circle round to finish his run in rear of the sheep with the mob directly between him and you. If he does this and stops or sits, don't hurry him, but let him think things out for himself.

When he has settled down, try to call him on to approach the sheep, keeping him well steadied. If he moves forward on to the sheep don't speak again until he stops. If he succeeds in getting the sheep moving towards you, keep moving backward so that the sheep are between you and the dog all the time.

If he sits down and is disinclined to move on to his sheep, move the sheep yourself and then call him on again.

As soon as he learns to come up on to his sheep, check him if he runs out to a flank, except when this is necessary to head the sheep back on to a straight course.

CASTING

The act of running out to take control of the sheep is known as "casting" and the ideal cast is one where the dog starts from behind the man and runs well out in a wide semi-circle, moving at a smart canter to a point immediately in rear of the sheep so that the dog, the sheep and the man are in a straight line.

BRINGING: Dog, sheep and man in a straight line with the sheep moving steadily down to the man.

Practise this with your pup, first using quiet sheep that have been thoroughly steadied. Teach him to cast from both flanks according to your signal, and occasionally stop him in mid-cast, call him back to you and send him round behind you and out on the other flank.

Start with short casts and gradually increase the distance. Check any tendency to "cross the cast", that is, to cross between you and the sheep, and stop him immediately if he splits off one or more sheep from the mob or goes between scattered sheep. The cast should be wide, so as to collect any stragglers into a compact mob.

APPROACHING AND BRINGING

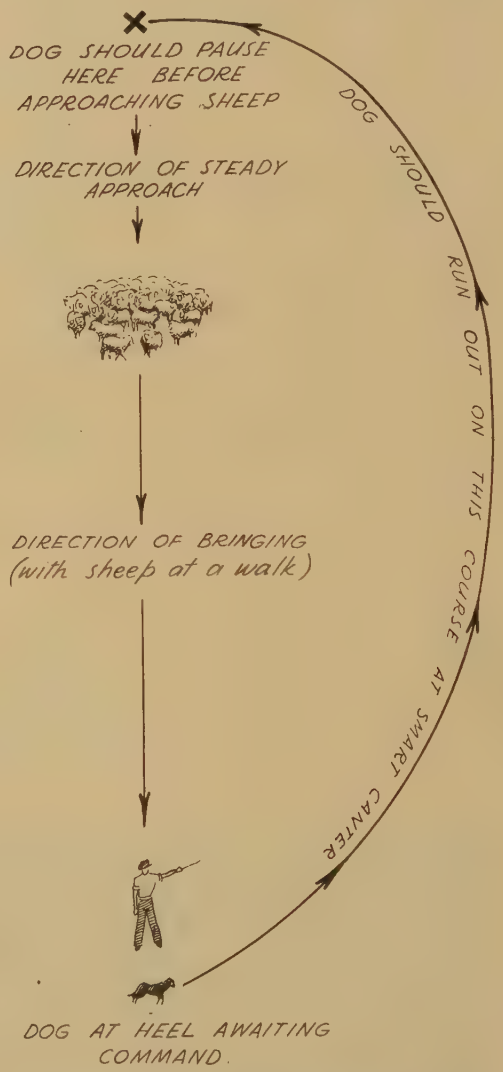
Having run out on his cast to a position in rear of sheep, the dog should pause, then move steadily in to take command of the mob, not dash in on his sheep and send them off at the gallop. By practising on quiet sheep in a small paddock you will be able to check him and curb any tendency to work too boisterously. Don't hurry this early training as that is where good habits are formed and bad habits are checked.

Having assumed control, the dog should bring the sheep in a straight line down to the man, preferably not letting them get out of a walk.

This work is best taught with a smaller mob of ten or a dozen sheep, as they will move more freely than a large bunch. They should still be quiet and well steadied for a start so that they do not dash around and excite the pup.

Practise casting him and getting him to stop "on balance" behind the sheep, then walk away and get him to bring the sheep after you. Move around the paddock slowly and encourage the dog to bring the sheep after you wherever you go.

When he has learnt this lesson, try to get him to put the sheep through a gate, first going through the gate yourself, and later with you standing near the gate while he takes the sheep past you. Use a good big gate for a start and give the pup plenty of praise and encouragement when he gets the sheep through.


DOG SHOULD PAUSE HERE BEFORE APPROACHING SHEEP
DIRECTION OF STEADY APPROACH
DOG SHOULD RUN OUT ON THIS COURSE AT SMART CANTER
DIRECTION OF BRINGING (with sheep at a walk)
DOG AT HEEL AWAITING COMMAND

CAST, APPROACH and BRINGING: In this diagram the desirable features of a good cast are shown. The dog should move out smartly on command, preferably running somewhat wider than shown in the sketch. Travelling at an even pace without any hesitation or checking, he should run to the spot marked X, where he should pause to size up his sheep. The approach should be smooth and forceful with no sudden movements to upset the sheep, and he should then bring them steadily towards the man.

DRIVING

From this stage, the natural sequence is on to the driving of a flock of sheep. When your pup will take the sheep through the gate, stand to one side and wave him on past you, following his sheep.

He may dash out to a flank in an attempt to head the sheep and bring them back to you. If this occurs, check him, call him back to heel and send him out on the other flank, checking him again before he gets far enough to head them.

Occasionally allow him to head the sheep however, otherwise he may refrain from heading them when needed.

By this time, your pup should be familiar with the various commands and signals and may be progressively introduced to more difficult tasks. If he is the right type he will have already begun to use his head when handling his sheep.

Try not to make the mistake of overcommanding him. Throughout the training period, while he should obey all your orders promptly, he should be given plenty of opportunities to do his own thinking and handle the sheep in his own way, so try to keep your orders down to a minimum.

A dog which can be sent out and left to handle the sheep without direction is a much better animal than the one which has to be directed in every move he makes.

For this reason, I usually make a point of allowing a young dog to work a mob of sheep on his own quite frequently, preferably in a small paddock where he cannot get too far away. This is good training as he learns by experience and has to do his own thinking. If he encounters any serious problems or persists in doing the wrong thing, he can be recalled and put on the right track without difficulty.

That, I think, covers most of the points of training a working dog, and if your pup has learnt these lessons thoroughly he will be well worth his rations and a far better dog than the majority of so-called working sheep dogs found on West Australian farms.

If you have any ideas of entering your dog in sheep dog trials, he will have received a sound basic training which should pave the way for the more exacting requirements of the trial course.

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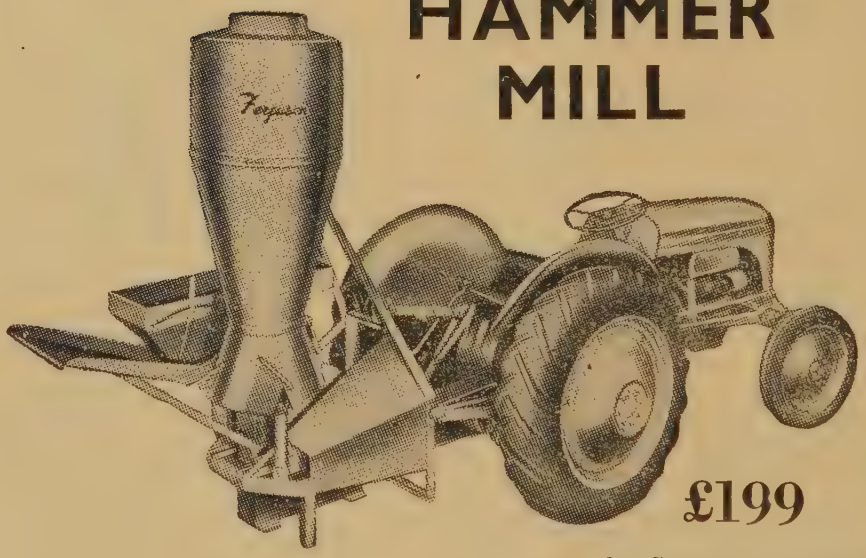

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FARM FENCING HINTS

2—BORING THE POSTS

By J. A. MALLETT ("Martingale").

BORING the fence-posts to take the wires is an important operation in fence construction. Unless the holes are well aligned and running parallel with the fence-line and the ground, the task of "running" the wires will be made very difficult, and the appearance and effectiveness of the finished fence will suffer.

If the holes are out of alignment, the wires are forced to make a number of slight changes of direction as they are threaded through the posts and the resultant friction makes it hard to drag the wires through a long panel of fence.

Obviously, the larger the holes, the less will be the tendency for the wires to "bind", but large holes weaken the posts, especially when small-diameter jamwood or boree posts are used. A half-inch bit is the size most commonly used for fence-post boring, but a five-eighths bit is permissible on large-diameter split jarrah and white gum posts.

HAND BORING

Most of the fences in this State have been bored by hand after the posts were erected and this is still a popular method, especially among farmers who only have fairly short lengths of fence to erect. A light rod is marked with saw-cuts to indicate the spacing of the holes. This rod is placed against the post and the position of the holes is marked on the post with chalk or a scratching tool. After that, it is merely a matter of boring the holes with a brace and bit.

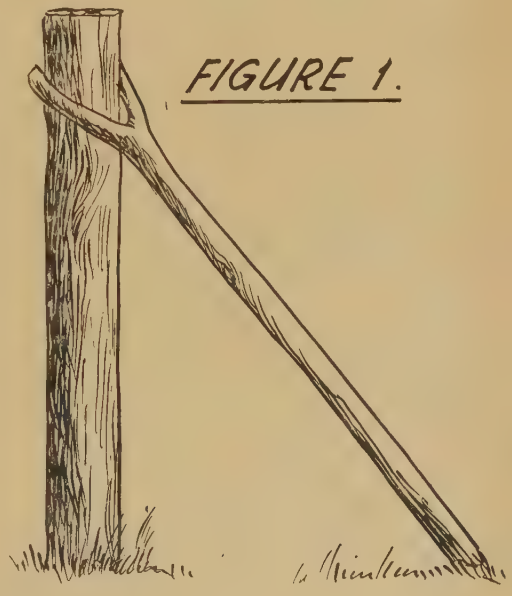


FIGURE 1.

FIGURE 2.

A tin of grease or mutton fat is kept handy and the bit is dipped in this at frequent intervals to make the work easier. A little practice soon teaches the operator to sight his bit directly along the fence line and to keep it reasonably horizontal when boring.

If posts are being bored immediately after erection; or when the ground is soaked with rain, it is a good idea to use a forked stick as a stay to prevent the posts from being pushed out of plumb while being bored.

The simplest form of forked stay is shown in Fig. 1, but an even better idea is to bore the first hole without a stay and then use a forked stick with a spike through the butt end as shown in Fig. 2.

When boring the holes for the bottom wire of a netting fence, it may be necessary to take out a shovelful of earth to allow room for the sweep of the brace to operate, as this wire is usually not far above ground level.

PRE-BORING OF POSTS

Many people favour boring the posts before they are placed in the ground and this method has certain definite advantages. It offers scope for the use of fairly simple mechanical boring appli-

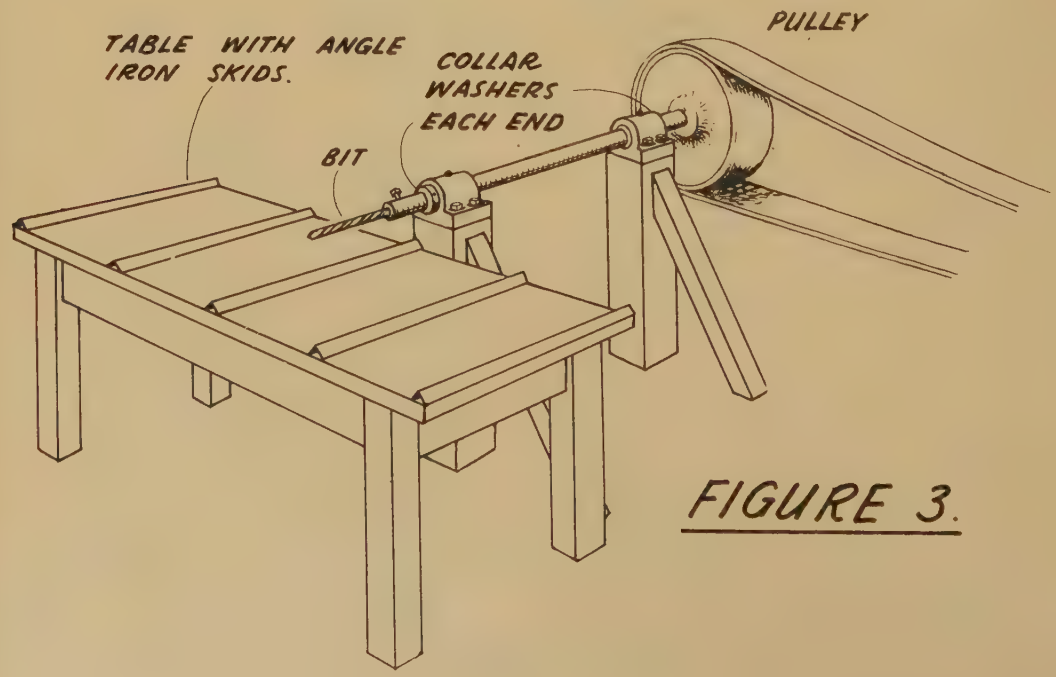


FIGURE 3.

ances, and the boring of posts provides profitable employment for wet days when outside work is impossible or at least highly uncomfortable. The simplest form of mechanical borer is a spindle set up as shown in Fig. 3 with a pulley suitable for operation by a stationary engine or tractor.

An old beater or peg-drum spindle from a harvester together with suitable bearings and collar washers could be made into a very useful boring machine by the average handyman.

One end could be fitted with a chuck, or an even simpler method would be to drill a hole in the end big enough to take the round shank of a bit from which the square tapered portion has been removed. File a flat surface on the bit shank and drill and tap a hole for a set-screw.

A half-inch bullnose auger or a Cleveland woodbit would be good tools for this type of power boring, but if an ordinary twist bit is used it is advisable to file off a portion of the point so that it does not "draw" too fiercely at high speed. The actual speed of the bit will, of course, be governed by the size of the pulleys and the r.p.m. of the engine, and these will have to be determined by trial and error.

The table should be fitted with a few skids such as lengths of angle-iron with the outside angle upward so that the posts slide easily.

Great care should be taken to have all the holes bored on the same plane, so do not allow the posts to roll backward or forward when moving them into position for the drilling of the next hole.

Where a barbed wire is used on the top of the fence, it is a good idea to drill the top hole at right angles to the others instead of parallel with the fence-line. The reason for this will be explained later when we discuss the runnning of the wires.

If this hole is bored first, a length of round iron or dowel stick can be poked into the hole to serve as a gauge when boring the other holes in the post. If it is kept upright as the post is slid along the table, this will ensure that the remaining holes are bored at right angles and on the same plane.

MECHANICAL AIDS

A friend of mine who is an engineer as well as a farmer, invented and constructed a machine which operated six bits simultaneously and bored the six holes in one operation. Such a machine would only be warranted where large numbers of posts had to be bored, but there are a number of other mechanical boring aids available today.

Now that many farmers have 32-volt generators, electric hand drills are widely used to bore fence-posts. They may be used for pre-boring the posts at the homestead or may be mounted on a cart or wheelbarrow and taken along the fence-line using a light air-cooled engine and a long flex which permits several posts to be bored without moving the generator.

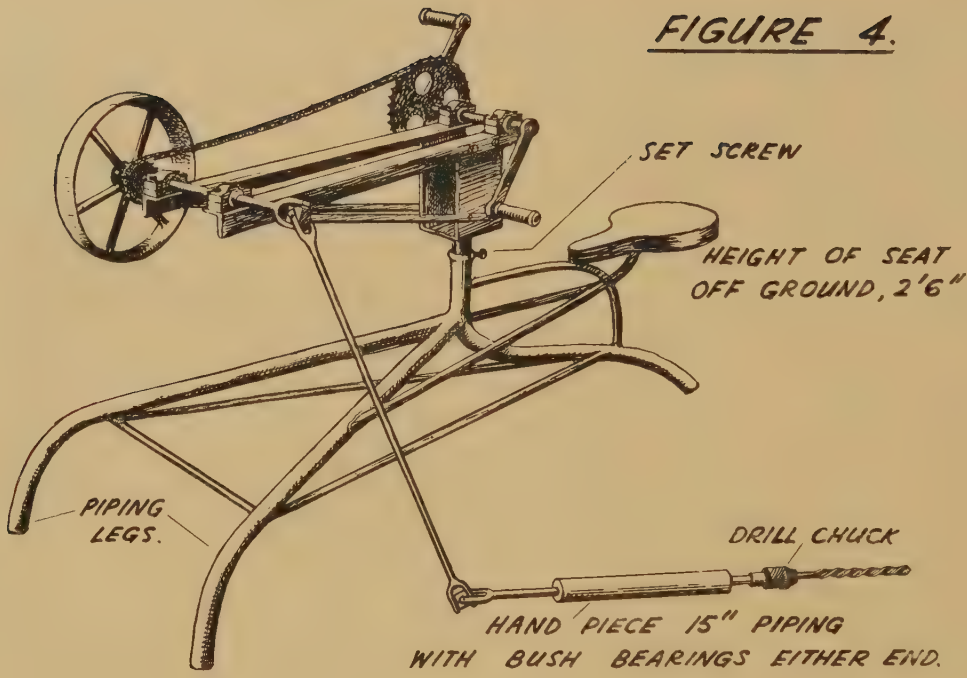
A proprietary portable post-boring plant has been on the market for several years. It incorporates a small petrol engine with a flexible drive-shaft terminating in a hand-piece carrying a drill chuck. Some farmers have converted one-stand shearing plants into similar outfits.

Long before portable engines were in common use, various attempts were made to speed up hand boring. Nearly half a century ago, the machine shown in Fig. 4 was invented and constructed in this State and I am told that it was used in erecting the No. 1 Rabbit Proof Fence.

It was made of light piping and angle steel and incorporated cranks similar to those on a bicycle with a chain drive operating a spindle which carried a flywheel.

The final drive was by rods fitted with universal joints, leading to a handpiece and drill chuck. Two men operated the machine, taking turns at working the cranks.

FIGURE 4.



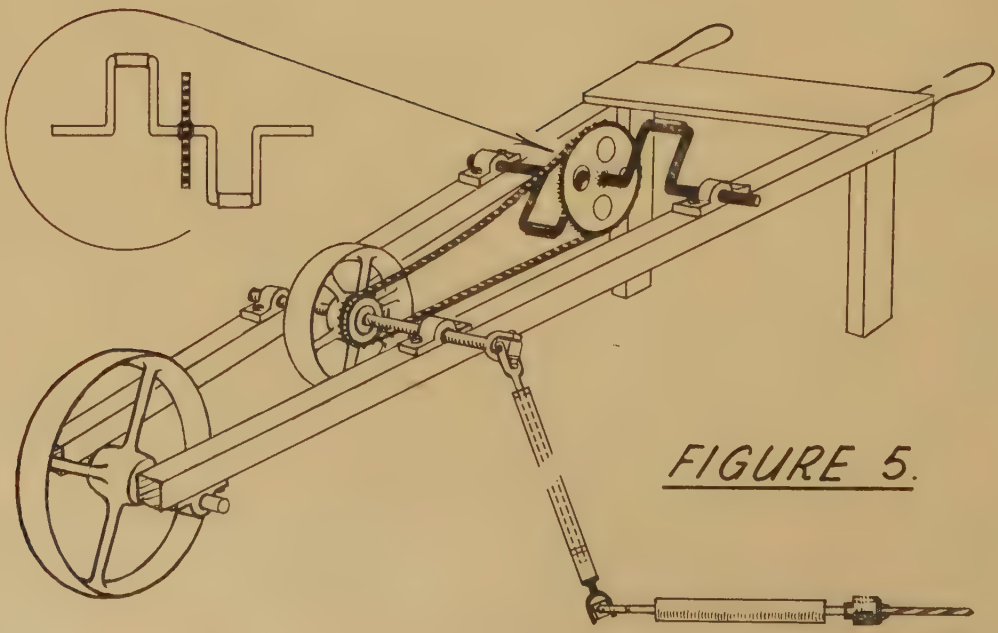


FIGURE 5.

Several ingenious farmers constructed similar machines which incorporated the same principles and the wheelbarrow arrangement shown in Fig. 5 was a typical example. In this model, the spindle was fitted with a universal joint connecting it to a length of square rod sliding inside a pipe fitted with a square collar.

Another universal joint connected the pipe to the rod leading to the drill chuck. A shorter length of pipe acted as a handpiece and had a thrust washer at the chuck end.

The maker claimed that the time saved by using this machine more than paid for the employment of the extra man, but in these days of scarce and costly labour it would be a simple matter to fit a small petrol engine to take the place of the crankman.

STAPLED WIRES

The attachment of wires to posts by staples, in lieu of boring the posts, is not regarded with favour in this State and most financial institutions stipulate that posts must be bored.

Possibly one reason for the unpopularity of staples is that our hardwood timbers do not permit the easy driving of staples when dry. When the staples are driven into green timber posts, our long dry summers are apt to dry out the posts and permit the staples to loosen.

Nevertheless, stapling has certain advantages. Apart from a saving in time as compared with boring, it permits the rapid replacement of posts damaged by bushfires, falling trees, termites and other causes—and the stapling method is useful for the erection of temporary fences.

If staples are used they should be driven in slightly askew so that the two points are not in line along the grain of the wood where they could cause splitting. The individual staples should also be zig-zagged down the post for the same reason.

Staples should not be driven fully home but should have a loop protruding from the wood to facilitate extraction and to prevent jamming of the wires which would interfere with satisfactory straining.

THE SPINNING JENNY

With our posts erected and bored, the next task is that of running the wires. This is a simple task if the holes are reasonably well aligned.

First we will need a "spinning jenny" which need not be a particularly elaborate affair. Obtain two pieces of 4in. x 2in. or other suitable timber about 2ft. 6in. long and half-joint them to

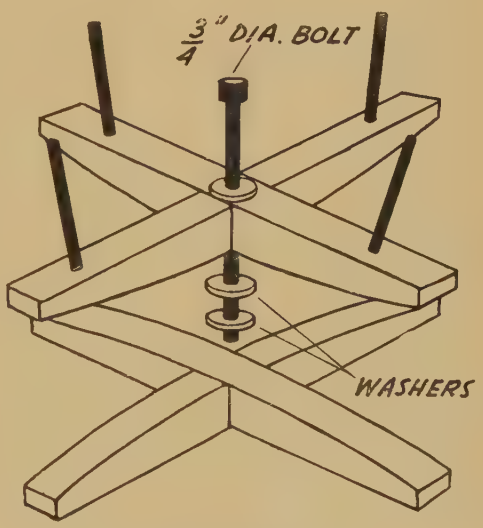
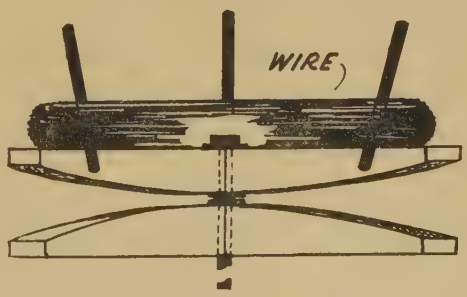


FIGURE 6.



form a cross which serves as a base. Taper off the upper surfaces as shown in Fig. 6 and bore a ¾in. hole through the centre. Make another similar cross, this time tapering off the undersides of the arms slightly.

Bore two or three holes in each arm of this cross to take wooden pegs or broken drill spokes to hold the coil of wire. The holes should have a slight lean towards the end of the arms so that the pegs slope outwards at the top and prevent the wire from rising too high as it unwinds.

Fit a couple of washers or an old drill-disk between the two crosses and apply a smear of axle-grease. Put a 9in. x ¾in. bolt through the central holes, driving it into the ground to give extra stability, and the spinning jenny is completed.

Remove the pegs and lay the coil of wire in position on the cross. Replace the pegs and then remove the tie-wires from the coil and you are ready to draw out the wire, preferably from the centre of the coil where it is less likely to tangle.

A useful substitute for a spinning jenny is the coil holder shown in Fig. 7. Take a suitably-sized forked branch, and bolt or wire two cross-pieces across the forked portion as shown in the sketch. Tie two wire loops to the frame as shown, making the loops of such lengths that they will not quite meet when pulled towards the centre. Lay the fork on the ground with the cross-pieces uppermost, put the coil of wire in position on the crosspieces and bring the loops over the coil where they can be connected with a short strap.

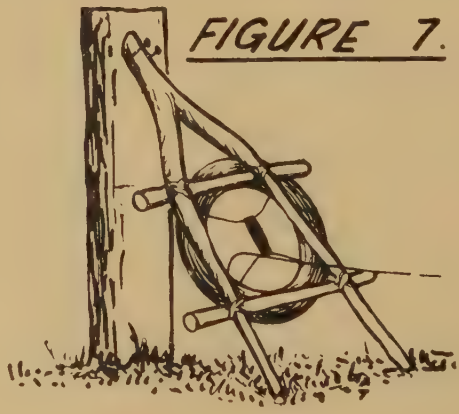
To run the wires, lean the butt end of the fork against the strainer post with the coil of wire downward. Remove the tie-wires from the coil and draw the wire through the fork commencing from the inside of the coil. If the wire runs too freely, tighten the loops by means of the strap.

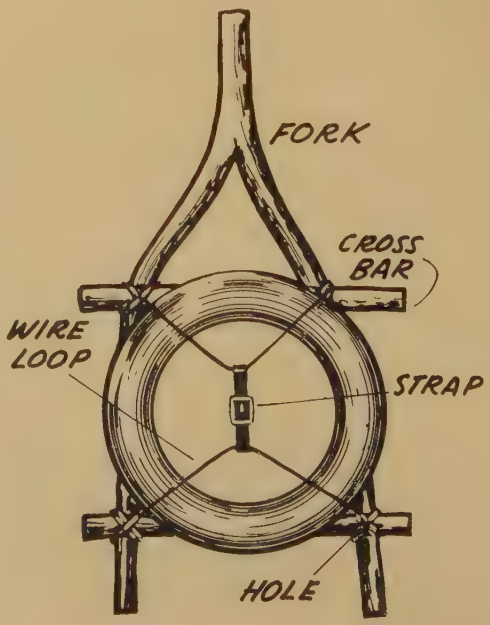
RUNNING THE WIRES

When putting the wires in the fence, the spinning jenny or coil-holder is placed near the first strainer-post from the corner, and the bottom wire is threaded through the posts until the corner-post is reached.

The strainer-posts are not usually bored but are marked with the positions of the wires, according to the spacings of the holes in the ordinary posts. It is a good plan to take the wires round the strainer-posts twice or three times

FIGURE 7.





before securing them so that there is always spare wire on the fence to allow for repairs, if wires are broken at a later date.

Having run and tied the bottom wire, return to the spinning jenny, cut off the wire at a suitable length and stick the end in the ground, then proceed to run the remainder of the wires in a similar manner.

RUNNING BARBED WIRE

The common method of running out barbed wire is for a crowbar to be passed through the reel so that it can be carried by two men. One end of the wire is tied to a post and the wire pays out as the men walk along.

It is an uncomfortable business, as the revolving reel is liable to slip to one end of the crowbar if the bar is not level or if one man gets in advance of the other—and that usually means damage to skin or clothes.

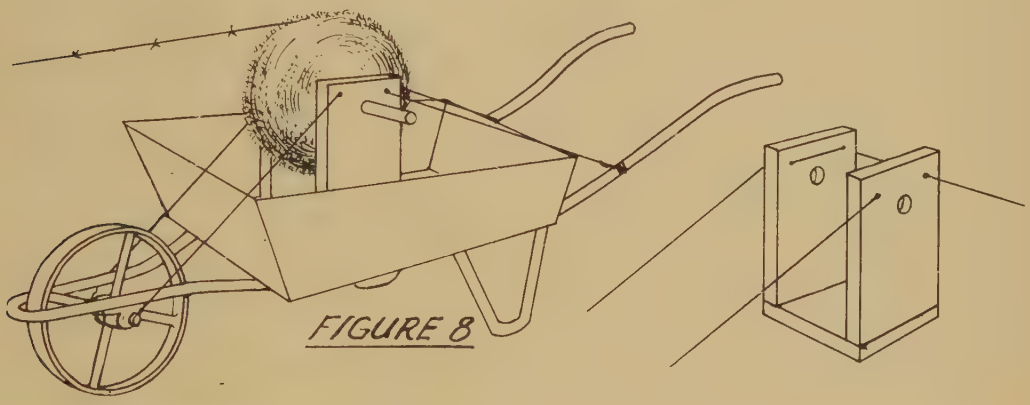
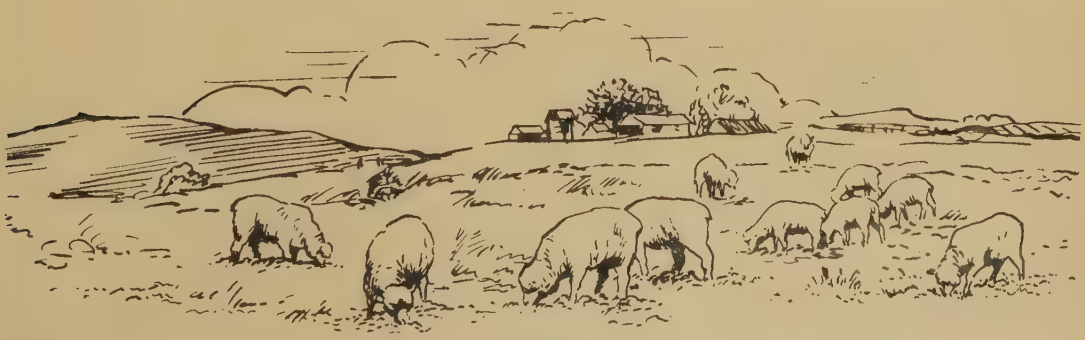


FIGURE 8

As the degree of effort needed to pull the wires through the posts increases rapidly with the distance of the pull, it is a good plan to place the spinning jenny halfway between the strainer posts on long strains. Wires may then be run to strainer posts in two directions and tied to each. Straining is then carried out from the centre of the span instead of from the post.

A better idea is to make a reel-holder as shown in Fig. 8. This may be placed on a cart or wheelbarrow which makes its operation a one-man job.

(To be continued.)



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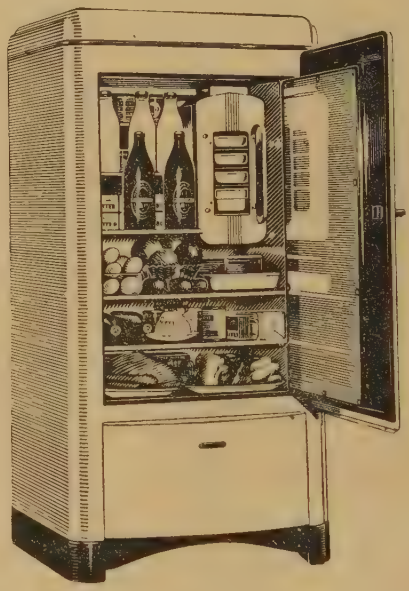

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Designing Contour Bank Systems

By J. P. FALLON, B.Sc. (Agric.), Adviser, Soil Conservation Service

"CONTOUR BANK" is the name applied to a ridge or bank of earth built across sloping ground between points of equal or nearly equal height. The basic function of a contour bank is interception of run-off water. This water is then either absorbed or conducted slowly from the land, depending on the condition of the soil and intensity of run-off. It should be kept in mind, that in soil conservation work contour banks are not a substitute for, but supplementary to, suitable plant cover and careful land management.

To rely on contour banks without giving attention to improved pastures, cropping and grazing methods would be as great an error as to attempt to use only pastures and land use methods for erosion control in places where alone they cannot be effective. The previous article in this series tells of the special place that contour banks hold in the general soil conservation programme. It also indicates conditions under which banks are likely to be required to support good land management practices. This article deals with some of the more important aspects of the designing of contour bank systems.

Designing contour layouts involves much more than the ability to use a surveying instrument. However, a high degree of technical knowledge is perhaps not so important as the faculty of good judgment combined with an

This is the fourth article of a series which commenced in the January-February issue of the Journal—a series which outlines the principles of soil conservation and their main applications in Western Australia. It is hoped that the articles will help to impress upon farmers the need to conserve the soil and prevent erosion, and will point the way to the practical application of suitable soil conservation techniques.

The Soil Conservation Service exists to co-operate with farmers to this end. If you would like an officer of the Service to visit your property to discuss your soil conservation problems, write without delay to the Commissioner of Soil Conservation, Department of Agriculture, Perth.

agricultural background and a good understanding of the various erosion control measures. Generally speaking, unless farmers are prepared to buy or construct a surveying instrument of suitable accuracy, and are prepared to use it with unremitting care and attention to detail when surveying contour banks, they would be well advised to call on experienced help with their layout and surveying problems.

An article dealing with some of the types of simple levelling devices suitable for the layout of contour banks together with a description of how to construct and use them will appear in a later issue of this journal.

In the preliminary planning of any conservation programme for a farm, the entire property should be considered as a unit. This ensures that a layout for any one paddock may at any time be fitted into a comprehensive system without the necessity of greatly altering previously constructed bank layouts. Contour bank systems are planned according to the drainage pattern of the land, and the areas that can be effectively handled through any waterway, natural drainage depression or system of outlets. Such factors as ridges, roads, large gullies or property limits may determine the boundaries between the contour bank systems.

Frequently, adjacent farms on a watershed may be on the same drainage system. In this case, a contour bank system common to both farms may be used if agreement on details of layout, construction and maintenance can be arrived at between the farmers.

WATERWAYS

The first consideration in planning a contour bank layout must be the selection of safe outlets to handle the water which may be discharged from the banks. Under Western Australian conditions four main types of waterway are used.

(1) Specially prepared areas of level cross section and gentle grade (usually along a boundary fence or along a depression) which are put down to pasture. These areas should be fenced off if this is at all possible.

(2) Natural drainage depressions which may or may not be slightly gullied and which generally require the support of mechanical measures to prevent scouring.

(3) Gullies which must be treated and stabilised with special structures before being used as outlets.

(4) Large natural creeks.

In some cases it might even be necessary to use all four types of outlet in the one paddock. Because the waterways into which banks discharge are so vital to the success of the whole contour layout every effort should be made to make them safe. It is essential that the cover of pasture on these sites should be the very best possible for the area.

The next article in this series will deal with the problems of waterway selection and construction.

LOCATION OF CONTOUR BANKS

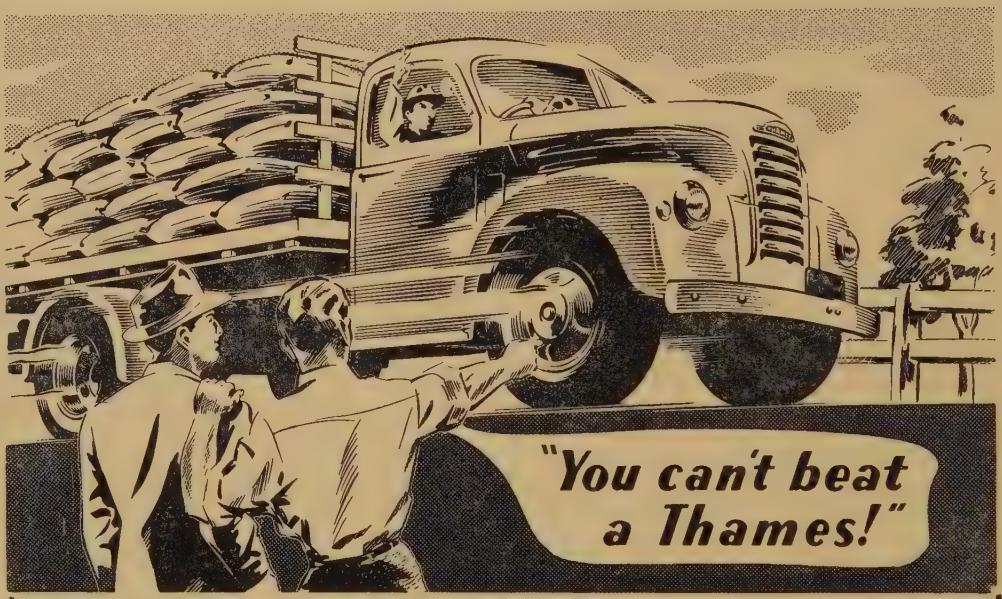
Individual contour banks should be located so as to provide adequate control of surface runoff, consistent with keeping normal farming operations as easy as possible and bank maintenance

work to a minimum. Some general guiding principles may be followed to obtain these ends.

Contour bank layouts are normally started near the top of the slope to be treated. The top bank should be placed so that the area it is serving is no greater than the areas served by the lower banks. The top bank is perhaps the most important one in the layout for, if it is overtaxed by runoff from too great an area, the whole system is likely to be severely damaged. A trial line should be surveyed and then adjusted up or down hill as needed.

Fig. 1.—Contour banks and associated earthworks on a paddock in the Northam district. Note the use of a diversion drain with pasture furrows above it, on areas where contour banks could not be used. Absorption banks are also shown. Two distinct types of waterway are used in this paddock.

Note also the contour banks continued through the boundary fence at the top of the photograph—an instance of co-operation between neighbouring farmers in the treatment of a watershed.



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Having located the top line, the other lines are surveyed at the required intervals. Frequently, an obstacle in a paddock (i.e. a large rock outcrop or patch of timber) necessitates starting a layout at that point. If this is the case, the other banks may then be laid out at the required intervals above and below, but care must be taken that the top bank is placed sufficiently close to the head of the slope. Contour banks should be kept as short as possible. Short banks are safer than long ones as they require less channel capacity and are therefore easier to construct and require less maintenance.

In order to decrease the length of bank draining in one direction a point roughly midway between two outlets may be selected and the banks graded from this crest to the outlets. Ridges are the ideal site for splitting the drainage in this way as they ensure flow in both directions towards lower spots where the waterways should be located.

In planning the layout, provision must be made for access of vehicles and machinery to all parts of the paddocks. These farm roads should be located on the contour immediately below contour banks or along the ridges where the drainage divides. In no case should a waterway be used as a roadway.

In many paddocks, it will be found that the selected waterways have insufficient elevation to take discharge from where the highest banks in the paddock would be located. In this case one of the following methods may be used to treat these areas above the top bank.

A. Where the slope above is very steep, and not well suited to cropping, particularly if it is broken by rock outcrops, the highest bank that will discharge into the waterway might be constructed as a diversion drain (i.e., bank of greater capacity and higher gradient) and pasture furrows laid out above it on the true contour. (See photo fig. 1).

B. An alternative to pasture furrows on land that is suitable for occasional cropping is the use of contour absorption banks. (Fig. 1 also). These are very large capacity banks and being on a true contour require no prepared outlet. They are constructed so as to pond water behind a very high bank and when full to overflow around the ends before overtopping the bank. This type of bank may be laid out at the same intervals as the normal drainage type contour banks. Blocks in the channel should be constructed to prevent any excessive accumulation of water at one point should the bank be constructed slightly off contour. The effective height of this type of bank will the the height of the blocks at the ends of the bank. These are usually one half to three quarters the height of the bank itself. If built any higher than this the bank wall is likely to be endangered.

C. In situations where no natural outlet is available and contour banks are required, it might not be feasible to build long lengths of absorption type banks. Normal drainage type contour banks may be used without a waterway if the area on to which they discharge is protected by short lengths of absorption banks and spreader furrows. This type of outlet would preferably be along a fence or in a situation which could conveniently be left out of cultivation. The aim of this treatment is complete absorption of any water that may be discharged from the banks. Failing this, any unabsorbed runoff is slowed down to non-erosive speed and finds its way to the main outlet or waterway in the paddock.

SPACINGS OF CONTOUR BANKS

The spacing or vertical drop between the banks depends upon land slope, rainfall, vegetation and the nature of the soil, all of which effect the amount of run-off. It also depends on the size of of the banks to be constructed and the gradient of their channels which limits the amount of water the channels can carry.

The degree of erosion hazard in any particular district determines the extent of the soil conservation measures necessary to effectively control run-off in that district. Broadly the farming areas in this State which have suffered most from soil erosion by water may be divided into two categories, according to the degree to which pasture improvement can be relied on to lessen the risk of erosion.

A. Areas where it is possible to develop improved pastures and longer rotations

Fig. 2.—Aerial photograph showing the layout of a contour bank system in the Northam district. Pasture furrows are used on the rocky slopes (top left). A natural creek and its tributaries have been used on the waterways in this paddock.

Fig. 3.—A contour banked paddock in the Mingenew district. Prior to treatment, this paddock could not be cultivated owing to the large number of deep gullies, some of which may still be seen crossing the white lines on the right of the photograph. The contour banks are graded from the centre of the paddock towards waterways at the top and bottom of the picture. Note severe erosion on left where gullies from 30 to 100 feet deep have been washed out. Had conservation methods been applied in years gone by, this land could probably have been saved. Today it is irreparably damaged.

using either subterranean clover, trefoils or minor clovers as the basic pasture species.

B. Areas where up to the present, improved legume pastures are not a practical possibility.

For those districts coming under the first division, the spacing of banks has been on a vertical interval of ten feet, (Obstacles sometimes necessitate a slight departure from this ten foot interval). This means that a bank is ten feet lower than the bank above it. On a ten per cent slope, banks would be 100 feet (1½ chains) apart and on a five per cent slope they would be 200 feet (three chains) apart. A slope is five per cent if there is a fall of five feet in one hundred feet along the ground straight downhill. If banks are put in

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on more gentle slopes (i.e. less than 3% this vertical interval should be decreased so that the area between banks will not be excessive.

On the areas where it is not yet possible to establish and maintain improved legume pastures, a spacing of 2-3 chains, according to the steepness of the slope, should be used. Where it is thought necessary to put banks on very steep slopes the 2 chain spacing should be reduced to 1½ chains, as banks built on steep slopes have less channel capacity than those constructed on more moderate slopes.

The vertical interval spacing of ten feet as extensively used by the Soil Conservation Service in this State has been found successful under our farming conditions. The selection of this interval has been in the light of the experience of the Soil Conservation Services of the U.S.A. and the Eastern States of Australia modified to suit Western Australian climate, land slopes and soils. Wider spacings have been tried and found to be unsatisfactory. In view of the type of agriculture practised and the size of farm machinery used in Western Australia the spacings advocated would seem to be a fair compromise between soil conservation ideals and general practicability.

GRADES OF CONTOUR BANKS

This heading is technically a contradiction in terms. In the strict meaning of the words, a bank is not a contour bank unless it is perfectly level along its entire length. However, as explained in a previous article in the Journal, contour bank is the general name given

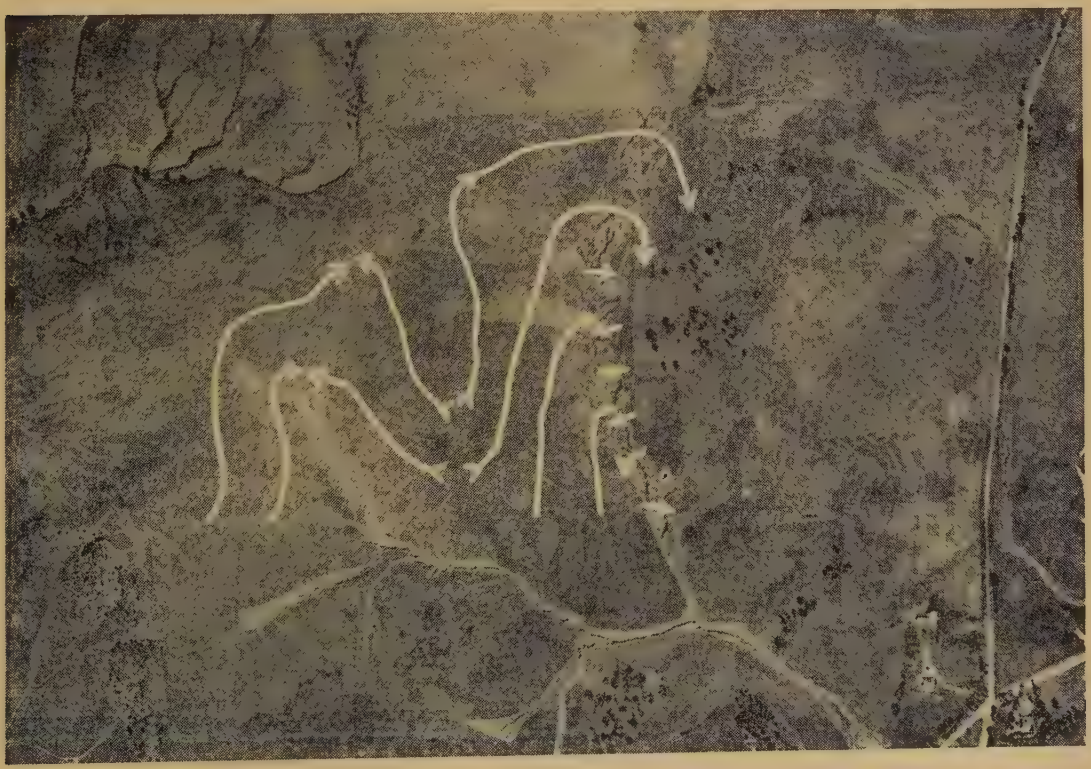


Fig. 4.—A system of contour banks in the Mingenew district. Treated gullies have been used as waterways in this paddock. Note severe gullying in other parts of the property (bottom right shows the worst example). Pasture furrows may be seen in paddock alongside the road at the left of the photograph.

to banks whether they are absorption type contour banks (i.e. on a true contour) or drainage type contour banks (i.e. banks with a slight grade to an outlet). For drainage type contour banks, the grade must be sufficient for the channel to carry the water, yet gentle enough to avoid scouring and promote some absorption. A variable gradient increasing with the length of the bank is generally used. The total length of a proposed bank is usually estimated and a variable grade established that increases towards the outlet by regular amounts. The grade is normally increased every 300-500 feet. It is advisable to fit the change of grade to such critical points as gully crossings or low spots if this can be done conveniently. Points where banks cross gullies or depressions are generally weaknesses in the bank. If the increase of grade can be made conveniently at these points, the tendency for banks to overtop and break will be partly eliminated.

Gradients used on normal drainage type contour banks in W.A. range from 0.2% - 0.5% (i.e. 2½in. per 100ft. to 6in. per 100ft.). For example, a bank 1600ft. long may be given a grade of 0.2% for the first 400ft. 0.3% from 400ft. to 800ft., 0.4% from 800ft. to 1200ft. and 0.5% from 1200ft. to its outlet at 1600ft.

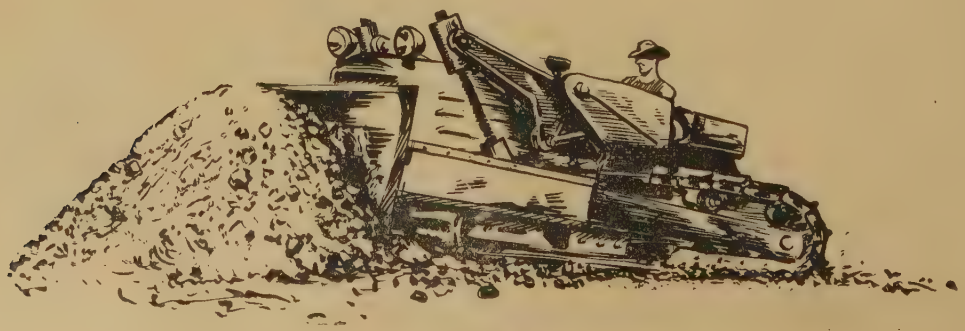
Gradients on diversion drains are generally a little steeper depending on the type of bank to be constructed, but they should never exceed 1%. If diversions are built with heavy earth moving plant (e.g. bulldozers) normal grades should be used. The reason for this is that large banks like bulldozer-built diversion drains have large capacities and allow a greater depth of water in the channel. As the depth of water in a graded channel increases, so also does its velocity and hence its cutting action. To prevent this the normal grades for ordinary drainage type contour banks are used.

TABULATION OF GRADIENTS FOR CONTOUR BANKS

Grade in %	Grade in inches
0.1%	1.2 in. per 100 feet
0.2%	2.4 in. per 100 feet
0.3%	3.6 in. per 100 feet
0.4%	4.8 in. per 100 feet
0.5%	6 in. per 100 feet
0.6%	7.2 in. per 100 feet
0.7%	8.4 in. per 100 feet
0.8%	9.6 in per 100 feet
0.9%	10.8 in. per 100 feet
1.0%	12 in. per 100 feet

LENGTH OF BANKS

Bank channels should not usually carry water for more than 1600-1800 feet (24-27 chains) in any one direction. However, in practice it is often extremely difficult to keep banks down to these limits. By grading banks to run both ways from a suitable point, the distance between waterways can be safely doubled. If banks of excessive length must be used, the end sections (i.e., last 1,000 feet) should be built up and the channels enlarged to give greater capacities.



SOIL CONSERVATION FARMING

List of Farmers Who Are Using Contour Practices

BY OFFICERS OF THE SOIL CONSERVATION SERVICE

A LIST of farmers known to be using contour practices for soil conservation, is printed at the end of this note. It will enable other interested farmers to find and see something of such methods. Now is considered an appropriate time to publish this list as many farmers will shortly be travelling through the countryside to agricultural shows and field days.

Soil conservation farming has been described as using every piece of land according to its capabilities, and in such a way that the fertility and the physical properties of the soil are maintained, or if possible improved. Any farmer who, with this ideal in mind, is adjusting his farming practices so as to reduce the danger of soil erosion by wind or by water, is a soil conservation farmer.

Suitable land management is the basis of effective soil conservation, but, on considerable areas of sloping land additional protection against running water is needed. This protection can be given by the use of the contour principle and all aspects of this work are being discussed in a series of articles which commenced in the January-February Journal this year.

The Soil Conservation Service has received many requests from farmers for advice on soil conservation and soil erosion problems. As yet it has not been possible for soil conservation officers to visit all the farmers seeking advice.

A large number of properties have been visited, and inspection of the problem and discussion with the farmer has taken place. In some cases in addition to adjustments to farm practices, it has been recommended that the farmer carry out work involving the use of the contour principle. The necessary surveys for marking out lines for the construction of contour banks, furrows, etc., have been made for farmers who were willing to do such work as part of a programme of adjustment of farm management practices.

Soil conservation work done in this State may be summarised under the following headings:—

(a) Farmers who, following advice from the Soil Conservation and other Branches of the Department, or on their own initiative, have adjusted their farm management programme so as to build up their soils against erosion.

(b) Farmers who have made adjustments as in (a) and have also carried out contour works to reclaim eroded soils, or to provide additional protection where active erosion has not become serious. The majority of farmers in this category have received technical assistance from the Soil Conservation Service in planning and surveying the contour work. However, some farmers have carried out the surveying work themselves, following advice from the Soil Conservation Service, and others have done the whole job for themselves.

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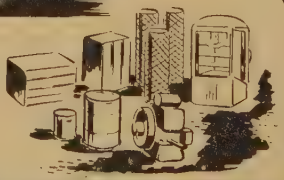

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It is not possible to list all the farmers who have already achieved or are in the process of achieving effective conservation of their land by adjustments in soil management. This process has been going on for many years with the gradual spread of improved pasture establishment. But most of the farmers who are also using contour methods can be named so that others may be able to watch the results. However, again we stress that although farming on the contour can be very spectacular, it is only one of the many farm practices which must be rationally used and co-ordinated to conserve our soils.

LIST OF FARMERS USING CONTOUR PRACTICES.

BALINGUP—
S. C. Maidment: Contour pasture furrows.

BEVERLEY—
Avondale Research Station: Contour banks, contour working, contour pasture furrows.
J. Woods: Contour banks, contour pasture furrows.
J. Young: Contour working, contour pasture furrows.

BINDOON—
St. Joseph's Farm School: Contour planted orchards, diversion banks.
War Service Land Settlement Properties: Contour planted vineyards, diversion banks.

BOLGART—
R. & L. Camerer: Contour working, gully structures.
G. T. Brockhurst: Contour banks, contour working.
D. Ludeman & Sons: Contour banks, contour working, contour pasture furrows.

BORDEN—
A. C. Main: Contour working, drains into dam.

BOYUP BROOK—
A. C. & M. R. Hadden: Contour banks.

BRIDGETOWN—
G. H. S. Hester: Contour drains in orchard.

BROOKTON—
V. G. Mills: Contour banks, contour pasture furrows.
R. F. Overheu: Contour pasture furrows.
E. R. Pech: Diversion banks, contour pasture furrows.
H. S. Whittington: Contour pasture furrows.

CHITTERING—
R. J. Ick: Contour drains in orchard (not contour planted).
F. J. Maddern: Contour planted orchard.
J. B. Hanson: Diversion banks in orchard.

COOROW—
G. Raffan: Contour banks.
G. J. Underwood: Contour banks.
R. Wallace: Contour banks.

CORRIGIN—
H. W. Gayfer & Son: Contour banks.

CUBALLING—
S. R. Knight: Contour pasture furrows.
W. W. Parsons: Contour pasture furrows.

DONNYBROOK—
A. C. Frost: Contour drains in orchard (not contour planted).
M. C. Fry & Son: Contour planted orchard, contour drains in orchard (not contour planted).
J. D. Hay and J. G. Grant: Contour pasture furrows.

DOWERIN—
A. F. Munyard: Contour working.

DUDININ—
H. H. Henderson: Contour working, contour pasture furrows.

DUMBLEYUNG—
R. H. Bairstow: Contour pasture furrows.

DONGOLOCKING—
Frost Bros: Contour pasture furrows.

EAST NARROGIN—
J. C. Bates: Contour pasture furrows.
R. & N. J. Pethybridge: Contour pasture furrows.
J. S. Prideaux: Contour pasture furrows:

GERALDTON—
J. J. Clune: Contour pasture furrows.
A. E. Grant: Contour pasture furrows, contour banks.

GNOWANGERUP—
V. J. McDonald: Contour banks, gully structures.
W. N. Smith: Contour banks.
R. M. Watterson & Sons: Contour banks.
G. P. Wellard: Contour banks.

GOOMALLING—
G. Sadler: Contour banks, contour working.
James Sadler: Drains into dams.
John Sadler: Contour banks, contour working.

GRASS VALLEY—
A. J. Cooke: Contour banks.
J. C. Dempster & Sons: Contour banks.
W. G. Spencer: Contour working.

GREENHILLS—
K. Halbert: Contour banks, contour pasture furrows.

KATANNING—
A Ladyman: Contour banks.
D. K. Norrish: Drains to dam.
H. A. Phillips: Contour banks.

KULIN—
Trotter & Davies: Contour banks.

MANJIMUP—
I. H. Davies: Contour planted orchard (walnut), contour working.

MILING—
J. A. Clancy: Contour banks.
R. H. Seymour: Contour working.

MINGENEW—
C. A. Berryman: Contour banks.
C. T. Cole: Contour banks.
W. Dempster: Contour pasture furrows.
F. D. Hoffman: Contour banks
Holmes & Holmes: Contour banks, contour pasture furrows.
A. R. & A. D. Hunter: Contour banks, gully structures.

MOORA—
H. L. Kelsall: Contour banks.

MT. HELENA—
G. Lane: Contour planted orchard, contour banks.

MULLALYUP—
F. Hawter: Contour planted orchard.

MOULYINNING—
E. J. S. Cook: Contour working, contour bank.
J. & B. Cook: Contour working.

NARROGIN—
H. A. Trefort: Contour pasture furrows.
R. Wiese: Contour pasture furrows.

NORTHAM—
J. R. MacKenzie: Contour banks.
C. W. Martin: Contour working.
Mrs. T. Martin: Contour pasture furrows.
S. McIntosh: Contour banks, contour pasture furrows, gully structures.
H. D. Morgan: Contour working.
W. J. Morgan: Contour banks.
W. N. Morgan: Contour banks.
Muresk Agricultural College: Contour banks.
J. Walsh: Contour banks, contour pasture furrows.
Wilding Bros.: Contour banks, contour pasture furrows.

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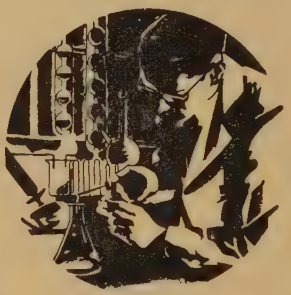

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NORTHAMPTON—
A. Rob: Contour banks.
E. L. Teakle: Contour working.
C. K. Teakle: Contour banks.

PEMBERTON—
F. R. McGann: Contour pasture furrows.

PINGELLY—
J. A. Groves: Contour working, contour pasture furrows.
T. H. A. Taylor: Contour banks, contour pasture furrows.
J. P. Marshall: Contour banks.
C. W. Hill: Contour pasture furrows.
F. Smith: Contour pasture furrows.

TINKURRIN—
H. F. Easton: Contour working, contour furrows.
C. W. Jackson: Contour banks, contour working.
H. Thomson: Contour banks.
C. E. F. Masters: Contour banks.
A. Thomson: Contour pasture furrows.
F. Easton: Contour working.
M. Doney: Contour working.

TOODYAY—
E. H. Lee Steere: Contour pasture furrows.
L. H. C. Jenkins: Contour pasture furrows.
J. S. McKay & Sons: Contour pasture furrows.

TOOLIBIN—
T. B. Angwin: Contour banks.

TOOMPUP—
I. Duncan: Contour banks.
F. C. West: Contour banks.

WAROONA—
N. McNeill: Contour pasture furrows.

WICKEPIN—
E. E. Fleay: Contour pasture furrows.
C. G. Avery: Contour pasture furrows.
J. Kerruish: Contour banks.
R. McDougall: Contour pasture furrows, drains to dam.
C. B. Parker: Contour banks.
T. G. Pauley: Contour pasture furrows.
C. G. Russell: Contour working.
W. H. Snow: Contour banks, contour pasture furrows.
M. B. Stott: Contour pasture furrows.
Est. late G. S. Wilson: Contour pasture furrows, drains to dam.

WILLIAMS—
E. A. Burnett: Contour banks.
B. D. Powell: Contour diversion bank.

WONGAN HILLS—
J. H. Ackland: Contour banks.
R. R. B. Ackland: Drains to dam.
Research Station — Contour banks, contour working.

YANDANOOKA—
J. A. Brown: Contour banks, contour pasture furrows, gully structures.
P. Lynch: Contour pasture furrows.
R. S. Campbell: Contour banks.

YEALERING—
H. J. Corke & Son: Contour banks, contour working, contour pasture furrows.
J. C. Butler & Son: Contour absorption bank, diversion bank.
W. G. Hotham: Contour working.
A. L. Neville & Son: Contour working, contour banks.
H. W. Lillystone: Contour banks, contour working, contour pasture furrows, gully control.

YERICOIN—
D. Duggan: Contour banks.

YILLIMINNING—
J. L. Ashworth: Contour pasture furrows.

YORK—
R. J. Leeson: Contour pasture furrows.
P. Monger: Contour banks.
W. & P. Seabrook: Contour banks, drains to dam.
R. D. Watts: Contour banks, contour pasture furrows.

YORNANING—
A. MacKinley: Contour pasture furrows, diversion bank, absorption bank.

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SHEARING TIME

Some Time and Money-Saving Hints

By M. BUTLER (Shearing Instructor)

SHEARING time on the farm with its attendant worries will soon be coming around. NOW is the time to see that everything is in readiness so that there shall be no hold-ups during the shearing. Any stoppages during shearing are costly to the farmer, and represent a waste of valuable time for the shearers. In order to ensure smooth shearing it is the farmer's responsibility to see that nothing over which he has control is left undone, particularly in regard to his machinery and shed equipment.

Costs in shearing are governed to some extent by the length of time taken to shear the flock. Any faults that exist in the shearing plant are a definite factor in increasing the time and the costs as they reduce the shearer's output, in many cases, by as much as 30 per cent. Unfortunately, this does not happen only in the one year, but applies year after year, totalling in the aggregate a large sum of money, sometimes more than the purchase price of a new shearing plant.

Many of the plants in present use have had their efficiency reduced by incorrect installation, while others that have been in service over a period of years have developed faults that impair their efficiency to a large extent.

Mostly these faults can be rectified at small cost and with little labour, but little attention appears to be paid to the overhead gear so long as it continues to run, and too often is heard the phrase—"Everything should be all right, the handpieces have been done up." But the overhead faults are allowed to continue, costing the grower much more for his shearing. Often it is a case of "Out of sight, out of mind," and little attention is paid to this important part of the equipment. By comparison, if the tractor was not functioning properly the farmer's loss would be apparent and repairs quickly effected.

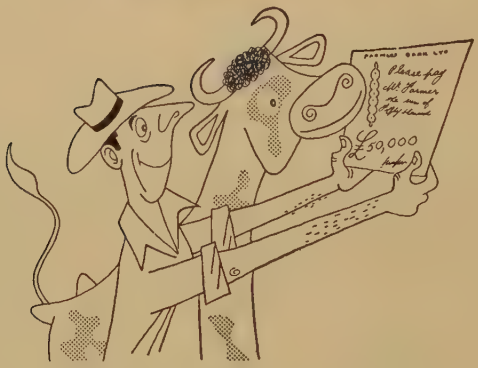
Some of the main faults that can, and do, occur in the shearing plant are dealt with in the following chapters.

SHAFTING OUT OF ALIGNMENT

This could be caused through warped planking, worn bearings, incorrect setting of the plummer blocks or brackets and in some cases is due to the uprights not being rigid, which will all cause excessive vibration in the shafting and downtube. This will lessen the shearer's control of the handpiece, retard his efficiency and speed, and increase the danger of skin cuts or more serious wounds on sheep. To eliminate these faults we must remedy the cause. Where the planking is badly warped, it should be renewed. Worn bearings will need relining or replacing, the shafting will need to be brought into proper alignment and the plummer blocks and brackets reset.

To line up the shafting the following method will be found simple and effective. Attach a piece of timber to each end of the plank and stretch a line parallel with the plank outside the friction wheels, level with the centre of the shaft. Bring the shafting true to this line and securely tighten the holding-

for a larger CHEQUE



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3 After milking, clean and sterilise all the equipment.

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down bolts. Check the shaft for level, adjusting the bracket arms up or down on the plank, using the slotted holes on the base of the bracket arms provided for this purpose.

THE GRINDER

The grinder is frequently erected in a poorly-lighted corner where it takes up the least room. It should be mounted in a roomy setting with a good light available. This is most essential, as tools cannot be ground properly in a poor light, or under cramped conditions.

Poorly-ground tools are a definite money loser to the grower and are the biggest single handicap to the shearer. That this is so is borne out by the fact that often a young shearer will reach a certain standard of ability in the agricultural areas, but on the first trip to the pastoral areas where he receives the benefit of expert grinding, etc., he will improve considerably in his shearing ability.

SLOW SPEEDS

Slow-running machinery is not conducive to good shearing. The correct shafting speed recommended by the manufacturer of the particular make of machine used should be maintained. Slow speeds require more tension on the handpiece which causes it to run hot and reduces its ability to cut cleanly.

To find the correct size of pulley to be used on the shafting, check engine speed with a revolution counter, multi-

Fig. 1.—Sheep being taken to machine.

ply by diameter of engine pulley and divide by shafting speed required. As an example, if engine speed is 600 RPM, multiply by diameter of engine pulley, say, 12½in. gives gives 7,500, divide by shafting speed, say 625, which gives 12in. which will be the size of pulley required on shafting to maintain correct RPM.

Any belt-slip that occurs should be arrested, but belts should not be over-tightened, or excessive wear in both the engine and shafting bearings may occur. Just sufficient tension to arrest the slip is all that is required and this tension is governed by the length and width of belt used. A low tension exerts more grip on both driving and driven wheels.

Fig. 2.—Finishing the belly.

TRANSMISSION BELTS

A slipping belt causes loss of power to the overhead shafting and reduces the speed in the handpiece, which must be maintained at 3,000 RPM for maximum efficiency.

LEATHER FRICTION CONES

The leather cones should make full contact with the bevel, or friction wheels, while the machine is in gear, as any slip that occurs will reduce the speed of the handpiece, particularly in

hard sheep. Close examination of older plants will sometimes reveal the friction wheel driving on only half or one-third of the surface of the friction cone. If this is found the cone will need to be trimmed with the paring chisel and bracket made for that purpose, until full contact is made and the maximum drive obtained. Some of the more up-to-date shearing plants have set-screw adjustments for this purpose.

Worn cones become small in circumference and do not present a large enough gripping area to the friction wheel and in consequence tend to slip and lose power. These should be scrapped and new cones installed. See that correct pressure is maintained between friction wheel and cone while machine is in gear. There are adjustments for this purpose.

Fig. 3.—Shearing up the neck.

DISTANCE OF DOWNTUBE FROM WALL

Insufficient distance between the downtube and wall is a common fault and is mainly caused by countersinking the planking. On many plants it is noticed that the universal joints have

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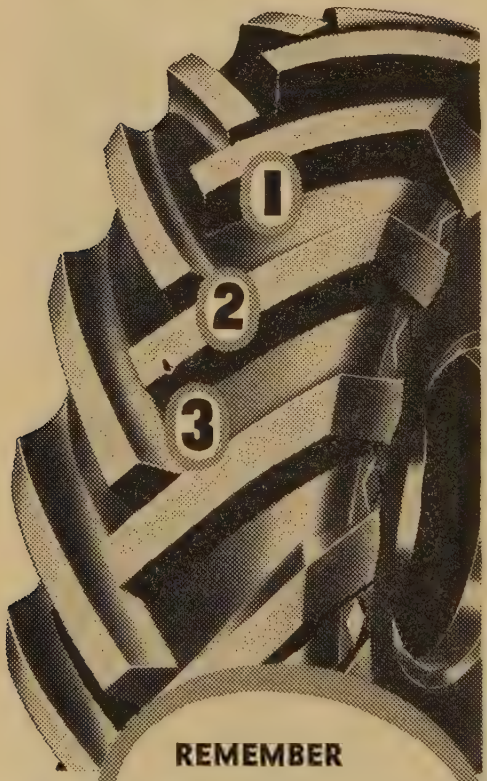

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worn deeply into the wall uprights through continually striking them during shearing operations. As a result, the shearer is forced to work out of the normal position, the reach of the handpiece is restricted and excessive second cuts and inferior work are all too common. The planking should not be lighter than 10in. x 4in. and should be *bolted* directly on to the uprights. This

DOWNTUBES

The short tube which is affixed to the downtube should just clear the floor. This gives the maximum reach and allows comfortable and efficient work ing. Often the short tube hangs well up off the floor, sometimes as much as two inches or more. This reduces the range of the machine and proves very difficult to shear with, particularly in big sheep.

Fig. 4.—Coming up from the long blow and finishing head.

will, when the plant is erected, bring the downtubes the proper distance out from the wall. Care should be taken to see that the face of the planking is vertical and the brackets truly horizontal, otherwise the downtubes will not hang perpendicularly.

The minimum distance between the wall and downtube should be 14 inches.

DOWNTUBE COIL SPRINGS

The coil spring on the downtube serves to give flexibility and range. It also serves to return the downtube to its normal position after each blow is made, helps in preventing the universal joint from swinging at random and is a big factor in assisting the shearer to effectively control the handpiece, to minimise false blows and second cuts. These springs can become weak and as

a result exert no control on the down-tube, which will then swing too freely and make proper control of the handpiece very difficult and, in a large measure, contribute to bad shearing. It will always pay to replace coil springs that have lost their tension.

WORN COGS IN UNIVERSAL JOINT

Universal joint cogs are subjected to considerable strain and when worn will cause chattering in the handpiece, particularly when the machine is fully extended when finishing off on the hind leg. Often, worn universal parts will cause a peculiar rope-like cut on the bottom tooth of the comb, which is frequently mistaken for a handpiece fault.

FERRULES

Joint ferrules that show excessive wear, or become loose, will affect the cutting ability of the handpiece and will also cause it to chatter slightly. Both back joint and universal ferrules should be tightly screwed up at all times and should be renewed if excessively worn.

Fig. 5.—Finishing off.

SAFETY CLUTCH

Lately there has come on the market a combination safety clutch and short gut core which is designed to reduce the accident risk. This safety clutch only

operates when locking occurs in the handpiece. Locking could occur as a result of foreign matter in the wool, such as sticks, or carelessness in assembling the comb and cutter, etc. Should the handpiece lock the safety clutch comes into operation and instead of the handpiece being violently wrenched from the hand, the gut cores can run freely until the machine is thrown out of gear. This can protect the shearer from possible serious injury and at the same time eliminate the risk of breakage of tools or gut cores and for these reasons is an acquisition in any plant. Full instructions are supplied by the makers.

DISTANCE BETWEEN STANDS

Shearing stands erected too close together can reduce the shearer's efficiency and can cause injury to both man and sheep. The minimum distance between stands by regulation is 5ft. 2in. Styles of shearing vary, some shearers work back, others slightly forward from the downtube. Young shearers are often out of position when shearing. Quite frequently as one shearer is removing the belly or crutch wool, the shearer on the next stand is finishing his sheep. This can and does result in the hind legs of both sheep becoming intermingled. This hampers both shearers considerably and the risk of accident or injury to man and sheep is increased. Even though no accident occurs the risk is always present when stands are too close and the shearer's attention is unduly focussed on the man working beside him, to the detriment of his own shearing. Stands could be placed 6ft. apart and would be better to be too wide apart than too close together.

CHUTES

Frequently the chutes to the counting out pens are not placed in the right position. This appears to be of little importance, but wastes time and can increase the work on the board and wool table as a result of the fleece becoming tangled when the shearer attempts to get the shorn sheep down the chute. In addition to wasting the shearer's time, the fleece cannot be picked up and thrown correctly when it is tangled and broken on the board. This results in delay and often poor work on the wool rolling table.

The proper position for the chute is six inches to the right of the downtube when viewed from the board.

HOT OR FULL SHEEP

It is a big mistake to pen for immediate shearing any sheep that have been brought straight in from the paddock, most probably bustled along and are hot and full. Sheep should always be given at least two to four hours to empty out and cool down in the yards. Sheep that are hot will be distressed during shearing and can "blue tongue" and die on the board as a result. Full sheep will kick and strain, making control and shearing very difficult. This is hard on both man and sheep.

A large proportion of the sheep in the farming areas are penned for shearing while still hot and full. Observation will reveal that sheep left in the shed overnight will be much quieter to shear than those brought in from the paddock and put straight on to the board.

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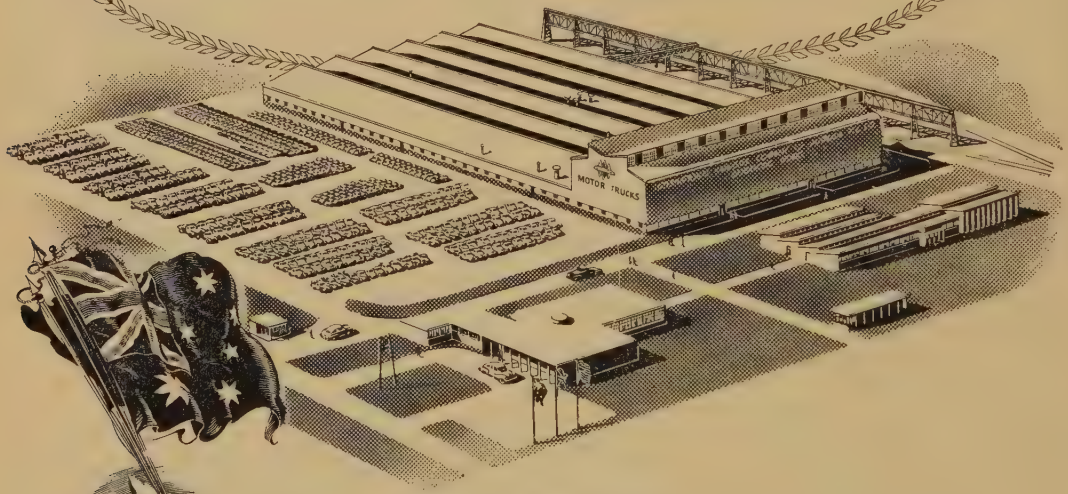

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GASCOYNE RESEARCH STATION

Successful Field Day at Carnarvon

ABOUT 100 banana-growers and local residents were present at the Gascoyne Research Station, Carnarvon, on May 28 when the station's first field day was opened by the Deputy-Director of Agriculture (Mr. A. L. McKenzie Clark).

Mr. Clark apologised on behalf of the Minister for Agriculture (Sir Charles Latham) and the Director of Agriculture (Mr. G. K. Baron-Hay) who were unable to attend. He said that he was pleased to have been asked to perform the opening ceremony as he felt that he was responsible, in some measure at least, for the establishment of the North-West Branch of the Department of Agriculture in December, 1950.

Mr. W. M. Nunn, the Officer-in-Charge of the branch, had been occupied for several years in the administration of the Kimberley Research Station and the Abydos and Woodstock Stations in the Port Hedland district, said Mr. Clark, so that he was already familiar with many of the problems of the northern areas.

Since the establishment of the branch, four agricultural science graduates and a beef cattle adviser have been appointed to the North-West and these officers will be employed on various extension and research projects aimed at increasing production in these areas.

Mr. Clark said it was the intention of the Department of Agriculture to widen the scope of the Gascoyne Research Station to embrace such work as pasture development and sheep husbandry. As a first step in this direction an agrostologist from the Wagga Research Station, N.S.W., would shortly be joining the staff of the research station. He would be employed on the development of drought-resisting grasses in collaboration with the Commonwealth Scientific and Industrial Research Organisation which is carrying out similar work in Queensland.

Mr. Clark said that he was sure that producers in the North would appreciate that sound farming principles could only be developed with the aid of scientific research and he hoped that the growers would feel that this was *their* station and discuss their problems freely with the Departmental officers.

EXPERIMENTAL PLOTS

Mr. W. D. S. Marr, the Tropical Adviser, conducted the visitors through the station's experimental section, giving commentaries on the various projects.

The first was the "close-planting trial," designed to determine whether it was practicable to plant bananas three times as close as is normally practised in the Carnarvon area.

The Gascoyne River in flood.

Showing method of planting pineapple butts.

The normal planting method is to plant on the square 10ft. x 10ft. (435 plants to the acre) in the first year. Three suckers or followers are left on each of these plants so that there are 1,305 in the second year. This number of producing stems is then maintained for a number of years.

In the close-planting trial now being tested, approximately 1,400 are planted in the first year and this number is maintained by leaving one sucker on each plant.

The weights and grades of fruit from the close-planted plot will be compared with those from an adjoining plot of identical area where the orthodox planting intervals were used.

Mr. Marr pointed out that if the trees on the close-planted plot give individual yields comparable with those of the wide-planted first-year trees, the grower's income would be three times what he would normally collect from a first-year crop.

Growers were shown a close-planted plot, one-third of an acre in extent, which had been established two and a half years ago. The appearance of the trees and the yield figures provided were most impressive and provoked much interest and discussion.

Sprinklers v. flood irrigation of bananas provided an interesting object lesson. The plants under flood irrigation were much taller and of a healthier appearance than those watered by sprinklers. It appears that the salt content of the irrigation water is more harmful to the plants when applied by sprinklers, a fact which is always much more noticeable under drought conditions.

PAPAW TRIALS

Interest was shown in several hundred papaw plants of selected Queensland varieties which were being grown with the dual object of testing the market and determining the best methods of packing and transporting the fruit to minimise wastage and damage.

Mr. Marr said that papaws might provide an additional cash crop to bananas and beans under Carnarvon conditions. One of the current problems, he said, was that at present they had no certain method of distinguishing between male and female plants in the young stages. Since only a small

Young bunch of bananas from plant eight months old.

proportion of males were needed for adequate fertilisation, surplus male plants had to be culled out and replaced by females until the correct proportions were established.

SOIL TREATMENTS

In the absence of the Plant Nutrition Officer (Dr. T. C. Dunne), Mr. W. M. Nunn gave a short description of the

A well-grown pineapple of the smooth-leaved variety.

soil treatment experiments designed to investigate the effects of varying quantities of gypsum, lime and sulphur on banana growth. Gypsum had been shown to have beneficial effects on diseased banana plants in the Yankeetown area but as the bananas on the research station did not suffer from the disease to any marked extent, no significant differences were to be seen on the treated plots.

Mr. Nunn expressed the hope that, in the near future, the Department might be able to carry out similar trials on bananas already affected by deficiency diseases and he hoped to obtain the co-operation of the growers to this end.

PINEAPPLES AND AVOCADOS

Conducting visitors over the area under pineapples, Mr. Marr, who was formerly an adviser on pineapple growing in Queensland, said that he was disappointed with the results obtained in growing this fruit at Carnarvon.

He had expected that pineapples would thrive under Carnarvon conditions, but to date, this had not been the case. Although the plants appeared healthy and robust at the time of inspection, they tended to deteriorate towards mid-winter. A small first crop could usually be obtained but the plants seldom threw sufficient suckers to provide a second crop. He attributed this to the high alkalinity of the Gascoyne levee soils, a condition which is only reduced with great difficulty.

He spoke concerning the avocado or "alligator pear" a popular tropical fruit in other countries which was doing well on the Gascoyne Research Station.

Showing spacing of pineapple suckers and method planting in slightly raised beds.

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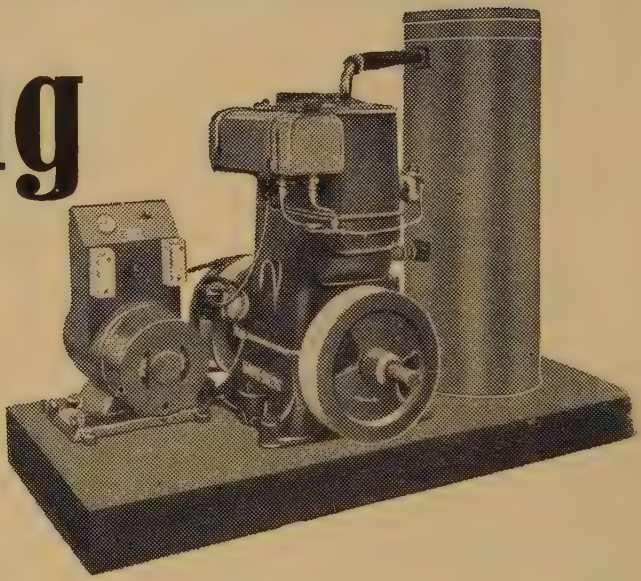

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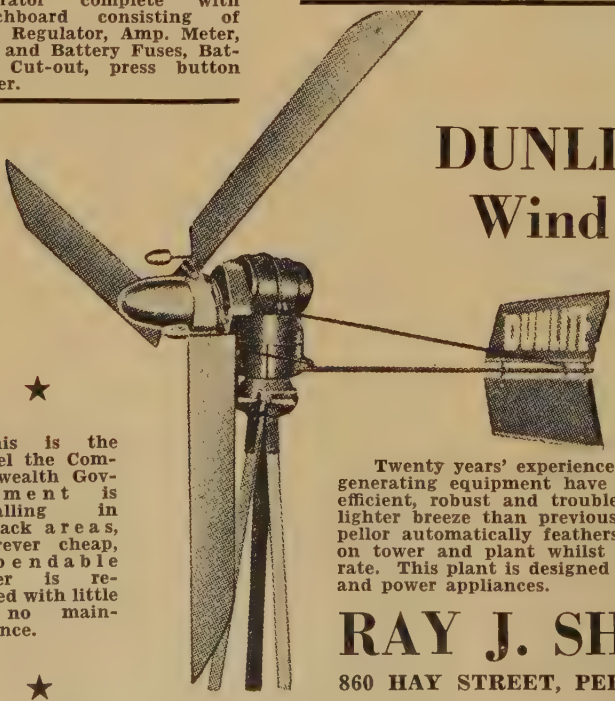

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While afternoon tea was being served by members of the Country Women's Association, Mr. R. G. Nailard, the manager of the research station, gave two short addresses. The first concerned the building of better packing sheds to ensure that bananas are handled under the best possible conditions before being sent to the markets. He then described the work carried out with bees at the station. Although the hives appeared to thrive in the area, they could not be regarded as a sound commercial proposition, he said, due to the lack of pollen over a large part of the year. Most of the nectar was obtained from the banana flowers which unfortunately do not produce pollen.

NEW BRANDING FLUID

A spectacular swing to the new L.B.E. sheep branding fluid is reported by Dr. M. Lipson, Officer-in-Charge of the C.S.I.R.O. Wool Textile Laboratory, Geelong, who claims the fluid meets a long-standing demand for a practical brand easily removed in scouring.

In explaining the development of L.B.E. (Lanolin Base Emulsion) Branding Fluid, Dr. Lipson said the prime object was to get a brand that could be removed easily during normal processing. Additional labour costs in removing brand residue and its adverse effect on the quality of woollen fabrics have been costing several hundred thousand pounds every year. In 1949, one firm alone spent over £20,000 in removing brand markings.

L.B.E. Branding Fluid meets manufacturers' demands for easy scouring and also graziers' requirements for a clear brand that remains legible and is easy to apply. The formula, first released by C.S.I.R.O. in 1950, is being used in South Africa, New Zealand and Great Britain, and Dr. Lipson expects the fluid will brand most sheep in Australia this season. A gallon, costing less than £1, is sufficient to brand 1,000 sheep.

Experience from research workers and graziers who have used this new branding fluid shows that certain precautions are necessary for best results:—

(1) Choose a colour that will contrast with the fleece, for example, a blue brand on red or black soil country.
(2) Avoid conditions that can cause rubbing of the brand before it dries. Remove the sheep from the pen as soon as possible and, where regulations permit, brand high up in the middle of the back.
(3) If possible, choose weather conditions permitting the brand to dry for an hour or two without the danger of smearing by rain.
(4) Do not use a brand made from thin wire carrying insufficient branding fluid.

Where regulations do not permit choice of colour or position, even greater attention should be given to the other directions. Special care is needed under more tropical conditions.

Further practical details can be supplied by sheep and wool extension officers of State Departments of Agriculture.

Research is developing new colours and a quicker drying fluid to reduce risk of the brand running when rain falls immediately after branding. Before any change in the present fluid can be recommended, a year's large scale testing is necessary on sheep properties in different climates, followed by commercial processing of the branded wool.

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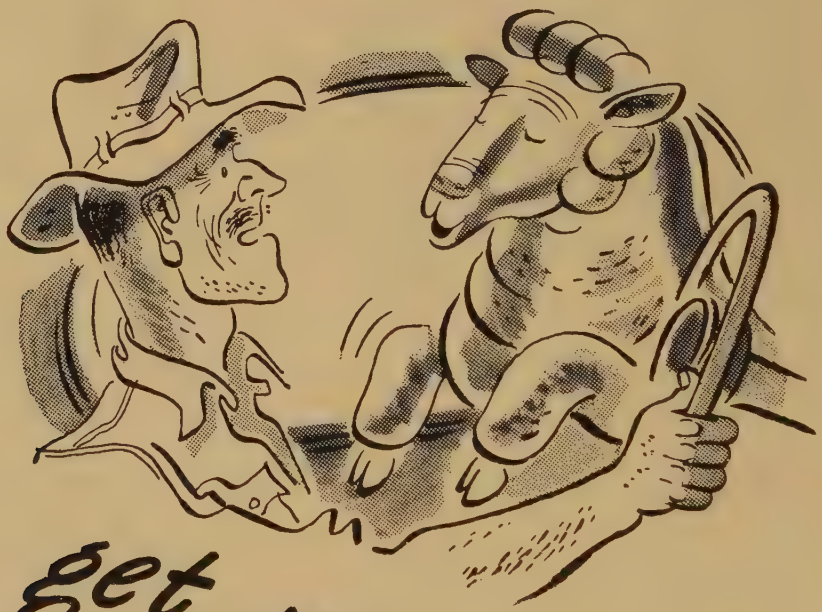

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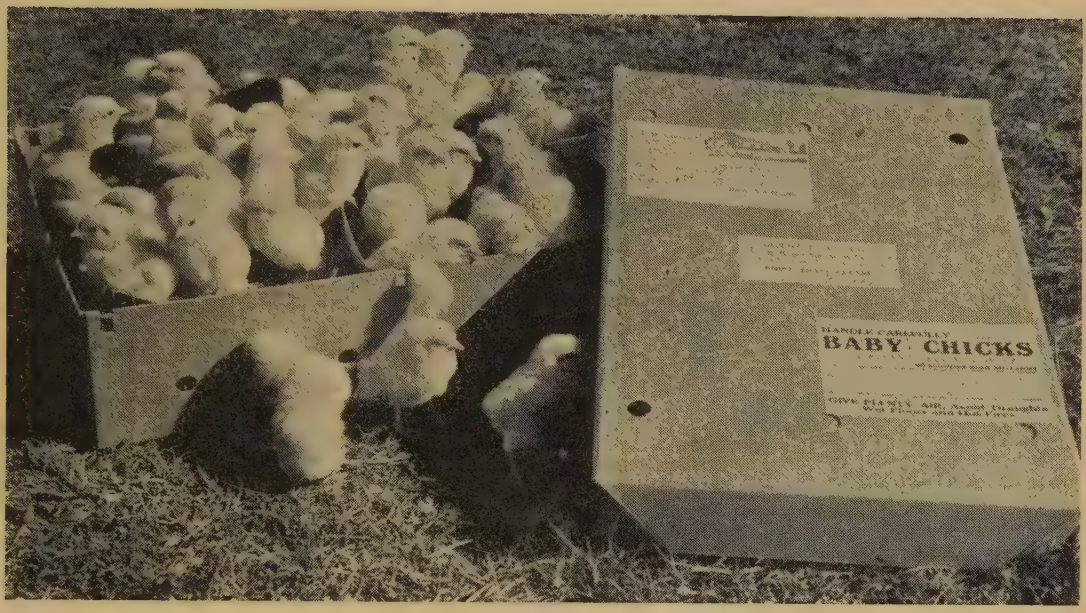

HINTS ON CHICKEN REARING

By R. H. MORRIS, B.Sc. (Agric.), Officer-in-Charge Poultry Branch,
W.A. Department of Agriculture

(Broadcast talk delivered during the A.B.C. Country Hour, and made available by courtesy of the A.B.C.)

THE ultimate profit to be made from poultry farming depends largely on how successfully each year's chickens are reared. A bird can be made or marred during its growing life and many aspects must be considered in rearing chickens successfully, some of the more important of which I will treat very briefly today.

The main requirement of a very young chicken is warmth, and it is well to remember that the chicken is better off with too much warmth than with too little. A brooder temperature of 95°F. should be maintained for the first three weeks. During inclement weather it is customary to keep chickens confined indoors for the first two weeks and when they are allowed out in the run at a two weeks old there is a possibility of them becoming chilled. Should this happen it is important that they should be able to scamper back to a brooder which is providing an abundance of heat. A brooder which has a temperature of 95°F. will enable the chickens to warm up quickly, and if this temperature is provided for the first three weeks, little mortality should result through chilling.

After the first three weeks the temperature is not so important and may be gradually reduced to 75°F. at five weeks, at which time the heat can be dispensed with altogether and the chickens taught to perch with the aid of a perching platform. It is very important to see

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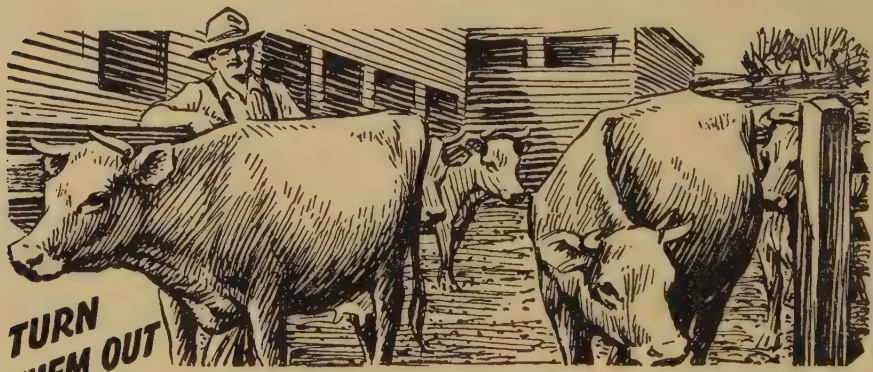

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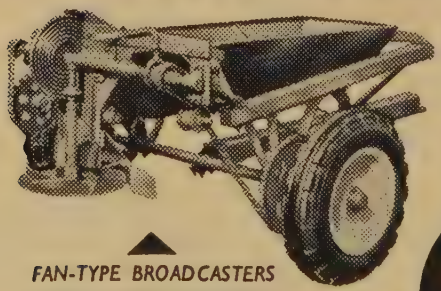

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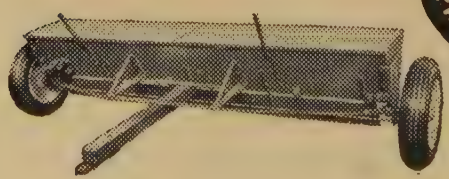

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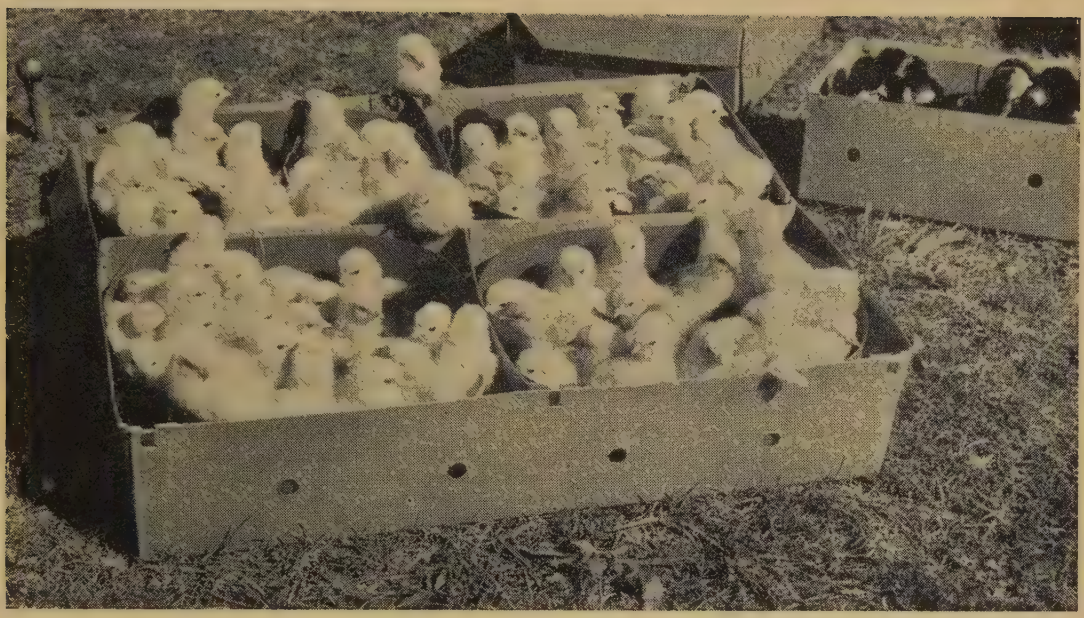

that the chickens go up on to a perching platform immediately the artificial warmth of the brooder is removed. This will prevent the chickens from huddling and smothering in a corner. Many chickens are reared well to the five week old stage but become stunted and ragged in appearance during the following weeks simply because they are not taught to perch early enough. Details for constructing a perching platform are available on application to the Department of Agriculture, St. George's Terrace, Perth.

All corners in the brooder compartment should be rounded off to prevent the chickens from packing in them, and the brooder should be in operation 24 hours before the chickens arrive. Overcrowding of the chickens must be avoided for good results and at least 1 sq. ft. of floor space should be allowed each chicken.

For the first week a guard made of flat iron and 1 ft. high should circle the brooder. It should be so placed that it prevents the chickens from straying too far from the source of heat, while at the same time allowing them to get away from the heat should they become overheated. In addition to helping the chickens to realise where the heat is, the guard also prevents any floor draughts from sweeping on to them and in this way prevents chilling.

Dampness must be guarded against in rearing chickens; and should be avoided at all costs. It is important for instance to see that the surface of the brooder house floor is at least three inches above ground level, and that the concrete floor is at least 12 months old before the chickens are brooded on it, as green cement contains moisture which is detrimental to the chicks. An ideal floor is one with one inch of concrete superimposed on three inches of cinders.

Three to four inches of dry sawdust is recommended as litter on the brooder house floor, and this can remain in the compartment for the full five or six week brooding period without being renewed. However, when the chickens are two weeks of age, the litter should be stirred daily and the litter under the

brooder replaced with that from around the outside edge of the compartment. At the same time, a little hydrated lime should be sprinkled over the litter and thoroughly incorporated in it. The lime will be found very effective in keeping the litter dry.

FEEDING

The correct feeding of chickens is an important consideration, and this aspect is treated in some detail in Departmental leaflet No. 995, which is obtainable free of charge on application.

A 16 per cent. protein diet is required for the first six weeks. Thereafter, the protein level can be gradually reduced to a 14 per cent. level at 13 weeks. The protein remains constant at 14 per cent. from 13 weeks until the pullets drop their first egg, at which time the protein should be increased to a 16 per cent. level. Buttermilk powder, because of its relatively high protein and riboflavine content is an excellent foodstuff for chickens and a four per cent. level in the chickens' diet is recommended.

Young succulent chaffed greens should be supplemented with one of the Vitamin A rich fish oils, and should the chicks be confined indoors for more than two weeks at a time a fish oil containing Vitamin D3 should be fed to prevent rickets.

One-eighth "all in" metal dust placed in a small receptacle in the brooder compartment will enable a better utilisation of food by the chicken by allowing the gizzard to work more efficiently.

Good growth demands a large food intake and this is only possible if adequate hopper space is provided.

DISEASES

A few remarks with respect to the most common diseases to which chickens are subject would be appropriate at this stage. These include pullorum disease, coccidiosis, fowl pox and worms.

As far as pullorum is concerned, when buying day old chickens you are advised to purchase them from a hatcheryman who draws his egg supplies from flocks that have recently been shown to have a low incidence of this disease. By being discreet in your chicken purchases, there should be little possibility of you experiencing this disease in your chickens.

Fortunately, most hatcherymen take appropriate steps nowadays to ensure that the chicks which they sell are from pullorum-tested flocks and consequently the heavy mortality which frequently occurred in years gone by in chicks at about the five-day-old stage is now the exception rather than the rule.

However, as far as coccidiosis, fowl pox and worms are concerned, there is a strong possibility that your fowls will contract each and every one of these complaints at some stage of their life and the consequent mortality and financial loss can be heavy unless appropriate steps are taken to prevent them, or in the case of coccidiosis to arrest the disease once the chickens have contracted it. The steps to be taken are simple and effective, but they must be carried out at the appropriate time of the growing period.

COCCIDIOSIS

Coccidiosis usually affects chickens when they are 6 to 10 weeks of age, but the disease can affect chickens as young as two or three weeks of age. The disease is characterised by the chickens losing their appetites and standing huddled and motionless with ruffled feathers and drooping wings.

Two forms of the disease are known, namely, the caecal form and the intestinal form. The former type is characterised by the passing of blood-stained droppings, and this evidence immediately tells you that the chicks have the caecal form of coccidiosis.

The recommended cure for either form of this disease is the feeding of either sulphamezathine or sulphaquinoxaline through the drinking water, and one of these drugs should be on hand when you take delivery of your chicks.

In successfully combating this disease, it is important that the sulpha drug be withheld until it is quite apparent that the chickens are sick with the disease. When one or two chickens have died, the drug should be administered without delay, hence the importance of having the drug on hand in case of an emergency. Within a matter of 12 hours of first administering the medicated water, a decided improvement in the chickens' health should have taken place.

FOWL POX

Fowls usually reach adulthood before becoming stricken with fowl pox, but it is when the chickens are 12 weeks of age that they should be given a lifelong immunity to it through vaccination. The vaccination is cheap, simple and very effective, and is a "must" in successful poultry husbandry.

WORMS

Growing stock are very susceptible to roundworm infestation, and because of the havoc which these parasites can cause, two thorough deworming treatments should be carried out when the chickens are 10 and 18 weeks of age respectively.

Carbon tetrachloride administered with the aid of a drenching gun is recommended in controlling worms and here again the appropriate steps taken at the right time will keep financial loss, which can be high from any of these complaints, to a minimum.

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A typical Salmon Gum on a wheatbelt roadside.

TREES OF WESTERN AUSTRALIA

By C. A. GARDNER, Government Botanist

No. 5—SALMON GUM (Eucalyptus salmonophloia *F. Muell.*)

THE name salmonophloia, meaning salmon-barked, was given to this tree in 1878 by Ferdinand Mueller, the famous Australian botanist. The title of "Salmon-Barked Gum-Tree" had already been bestowed upon this tree by the early settlers, a name which apparently referred to the colour of the bark in fracture when it resembles the colour of cooked salmon flesh. The external colouration varies from a brownish pink at the end of summer to almost white in winter, usually with greyish-purple patches.

From the early days of agricultural settlement in Western Australia, the presence of Salmon gums has been taken as an indication of a good class of loamy soil suitable for wheat growing.

Where it is associated with the Gimlet tree the soil is of a close texture and a heavy clay; where the Salmon gum occurs in pure stands, the soil is of a lighter nature. Early land classification was often based on the presence of one or both of these trees as indicating first-class agricultural soil.

In the agricultural areas today the Salmon gum is becoming rare except for its occurrence along roadsides, and even here many trees are being sacrificed to make way for telephone lines. One sometimes sees clusters of trees or isolated examples which have been left to provide shade and shelter for stock, and where this occurs one sees the Salmon gum at its best.

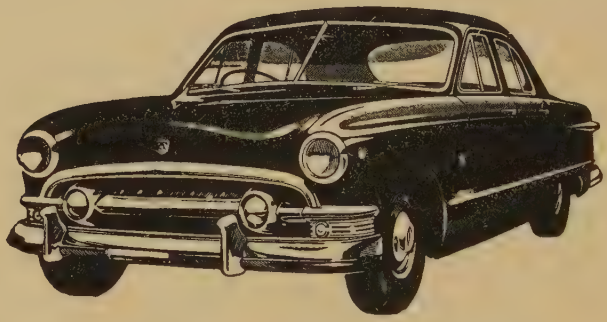
Perhaps no other Eucalyptus tree is more attractive than the Salmon gum which is noteworthy for its clean seasonal-changing bark combined with a heavy, deep green foliage, the lustre of which has a burnished appearance. Seen in the woodland the crowded trees possess relatively small crowns of an umbrella-like appearance, but when well-spaced, the trees branch widely and provide good shade. Of all the trees of the drier areas none is more suitable for planting or more decorative than the Salmon gum, if we except Eucalyptus Brockwayi, the "Red Mahogany" of the Norseman district.

HABITAT

The habitat of the Salmon gum extends from the Mullewa district southwards to the vicinity of Ravensthorpe and the Oldfield River. Its western boundary extends through Carnamah and Moora, thence to Seabrook, Brookton, Wagin and Gnowangerup, thence eastwards to Borden and Ravensthorpe. Its eastern limits are not well defined.

At Mount Gibson, in the Ninghan district, forest areas occur, and the tree is found commonly around Southern Cross and Kalgoorlie, and perhaps as far east as Goddard's Creek. It does not extend into South Australia. The township of Salmon Gums appears to be its southern limit on the Coolgardie-Esperance Railway, and it is found some little distance to the east of Norseman.

The tree occurs usually in pure stands forming open woodland formations in red loamy or light clay soils, sometimes mixed with gimlet, sometimes mixed with morrell and yorrel, or, in the East-



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SALMON GUM (Eucalyptus salmonophloia F. Muell.). A—Leaf; B—Flower buds; C1 and C2—Flower buds showing variation in shapes; D—Flower; E—Anthers; F—Fruits; G—Fruit, showing detail; H—Seeds.

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ern Goldfields districts mixed with many other species. Characteristic of the Salmon gum woodland is the absence or paucity of mallees as an understorey, and the open low scrub which provides the ground flora.

The Salmon gum is a tree attaining a height of up to 75 feet, with a trunk up to 40 feet long, and spreading-erect branches. Its burnished or lacquered, dark green foliage is a feature possessed by but few other trees. The bark is smooth throughout and rather thick, friable, and yellowish-pink. Its outer layers, then white or pale grey are shed in the months of March and April, revealing a light red new bark which in time fades to a pale pink or almost white colour, the old bark shedding in rather thick plates. The timber is deep red when fresh, but fades to a reddish-brown when dried. It is straight-grained and strong, and is used for domestic structural purposes, but will not withstand the ravages of termites. The sapwood is almost white. Trunks up to three feet in diameter are not uncommon in the southern regions of its area of distribution. The timber is used for mining purposes, and to a lesser extent for firewood.

The tree usually flowers in the summer months, between November and March, and the nectar of its blossoms is much sought after by birds and bees. It provides a fine, clear honey valued by the apiarist, and hollow trunks provide suitable hives for the naturalised bees.

Although in the woodland formation this tree has a narrow, umbrella-shaped crown, given space for lateral development, cultivated trees are of value for shade purposes. The tree is eminently suitable for cultivation as an ornamental or shade tree in the agricultural districts generally, and is of rapid growth. Individual, well-spaced trees may develop a crown spread of upwards of 30 feet, and such trees provide much shade. Under these conditions the Salmon gum provides superimposed leafy branches. The tree is shallow-rooted, and its roots extend radially from the stem for very considerable distances. The presence of these roots in the superficial layers of the soil after the trees have been destroyed, has provided farmers with excellent firewood for many years after the destruction of the trees during clearing operations.

In common with a number of other inland Eucalyptus species the Salmon gum foliage yields an oil which is rich in cineole (Eucalyptol) of the cineole-pinene type. Yields of 3.6 per cent. have been obtained, the oil having a cineole content of 77 per cent., but some give a yield as low as 1.4 per cent., with a cineole content of 46.4 per cent. Its commercial exploitation has not been extensively developed.

BOTANICAL DESCRIPTION

An erect, smooth-barked tree up to 75 feet tall, the trunk up to 40 feet, and three feet in diameter; bark, thick, smooth and friable; timber, deep red, strong and straight-grained. Branches spreading-erect, the branchlets reddish, somewhat angular. Leaves on slender petioles, alternate, lanceolate or oblong-lanceolate, 3-5 inches long, thick, the same colour on both surfaces, dark green, lustrous, somewhat sickle-shaped, copiously oil-dotted, the midrib fine, the lateral nerves inconspicuous and diverging from the midrib at a wide angle, the intramarginal nerve close to the margin. Flowers in axillary or lateral umbels of usually 5-7 flowers, the peduncle slender, and less than one inch long; pedicels (individual flower-stalks) short and slender. Buds obovoid. Calyx-tube almost hemispherical, tapering shortly into the pedicel, smooth. Operculum hemispherical, about as long as the calyx-tube, smooth, obtuse. Stamens all fertile, the filaments white, sharply inflected in the bud, the anthers short and broad, opening in parallel longitudinal slits. Fruit small hemispherical, the capsule 3-4-valved, the valves prominently exserted within the narrow, flat, annuar disc. Seeds small, ellipsoidal, reddish-brown. Cotyledons V-shaped.

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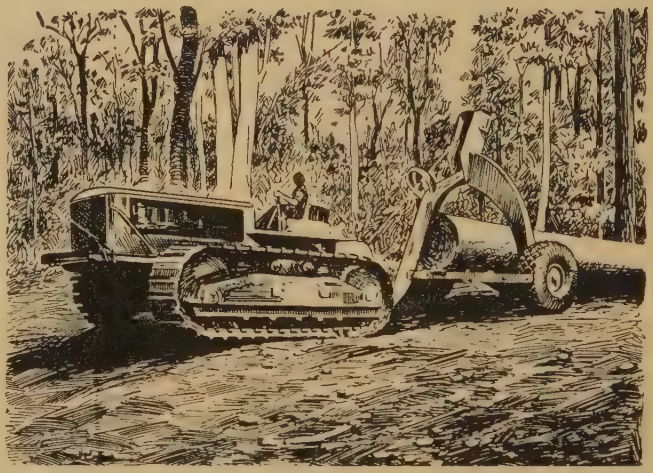

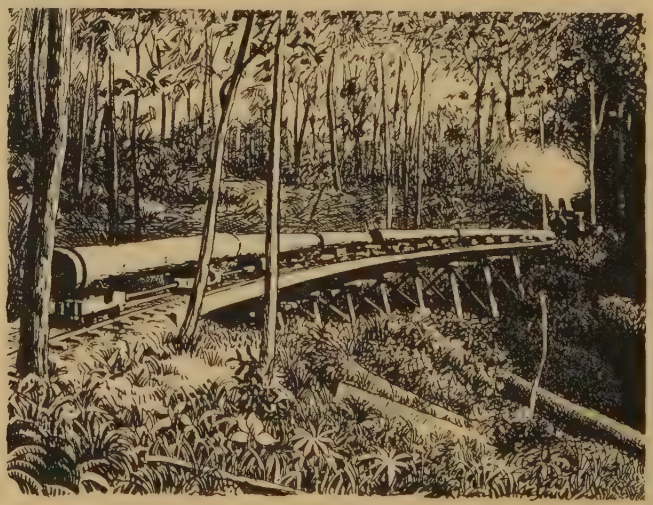

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No. 6—THE SCARLET PEAR GUM
(Eucalyptus Stoatei *C. A. Gardn.*)

NAMED after the present Conservator of Forests in Western Australia (Mr. T. N. Stoate) who first secured specimens of this tree, the Scarlet Pear Gum ranks among the most decorative of the smaller Eucalyptus trees of Australia. Its stature and habit render it an ideal subject for street planting and for parks and gardens. Of erect habit and small size, its dense, dark green foliage and the brilliant scarlet buds and young fruits render it at once conspicuous and attractive, and it deserves a place in any garden.

It is especially recommended for planting in the agricultural areas as it appears to thrive in both sandy and loamy soils. Its denseness and low branching habit make it highly suitable for windbreaks.

When used as a street tree it is attractive in appearance and, as it does not usually attain proportions which would interfere with overhead wiring, lopping is seldom necessary.

Those desirous of establishing these trees should transplant them early in the season, not later than the end of April. In common with all other Eucalyptus species, the roots will not tolerate interference when transplanting, hence it is important that the soil surrounding the roots should not be disturbed in transit but should be conveyed, still enclosing the roots, to the new site.

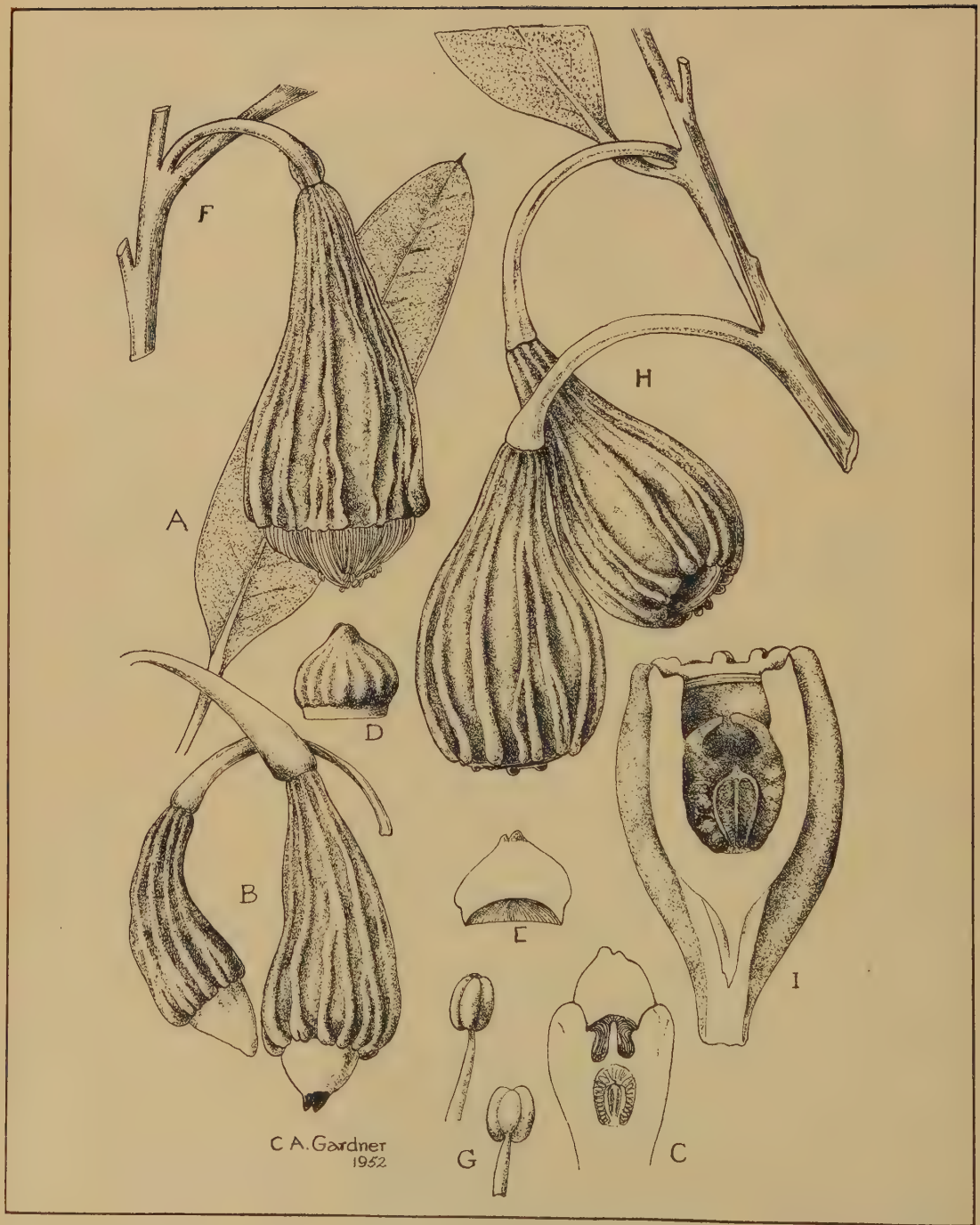
Plants may be obtained from the Forests Department Nurseries, Kalgoorlie.

The species is already in cultivation both in Western Australia and in Victoria where it is proving very popular. It has been grown successfully in a number of places in this State both in the metropolitan area and on the Eastern Goldfields where it has grown satisfactorily in the heavy soils in the vicinity of Kalgoorlie.

A specimen of Eucalyptus Stoatei growing on the Kalgoorlie Reservoir site.

HABITAT

The tree has been found in only one locality, an area to the east of Kundip,



SCARLET PEAR GUM (Eucalyptus Stoatei *C.A. Gardn.*). A—Leaf; B—Flower buds; C—Section of flower bud; D—Operculum; E—Longitudinal section of operculum; F—Flower; G—Stamens; H—Fruits; I—Longitudinal section of fruit. Icon. origin.

between Ravensthorpe and Hopetoun, in open scrub country on the tributaries of the Jerdacuttup River. The total area of its habitat is very small, amounting to but a few hundred acres. It has also been collected nearer Ravensthorpe, but the locality from which I first received the fruits remains obscure.

DESCRIPTION OF TREE

The tree attains a height of about 20 or 25 feet, with a single straight trunk and numerous short leafy branches making a compact, narrow and dense crown with dense branches and foliage. The leaves are alternate, stalked, the leaf-blade being oblong to oblong-lanceolate, thick, the same colour on both surfaces, deep green and somewhat lustrous, obtuse at the tip or with a short point, the lateral nerves indistinct and spreading, the intramarginal nerve distant from the thick, pale-coloured margin.

The flowers are produced singly on a long recurved flower-stalk which is broadened and flattened upwards or sometimes two-winged below the flower. The buds are pear-shaped and up to two and a half inches long, conspicuously longtitudinally and deeply ribbed, a number of the ribs often bifurcated upwards, and the operculum is ovoid-conical, usually black at the tip and often somewhat cleft, either smooth or somewhat ribbed, very thick, and inserted like a plug in the orifice of the calyx-tube. This thick, almost solid, operculum and its method of attachment are unique in the genus Eucalyptus.

The stamens are not numerous, and are deeply inserted in the calyx-tube, the yellow filaments being incurved in the bud and comparatively short. The fruit is pear-shaped, two to almost three inches long and up to two inches broad, scarlet when fresh, but becoming brown in age, conspicuously ribbed like the buds and calyx in flower, but more contracted at the orifice, the conspicuous ribs curving over to the orifice, the disc narrow and horizontal, the capsule 4-valved, deeply sunk with deeply included short valves. The fertile seeds are black, somewhat pyramidal, with an irregular wing.

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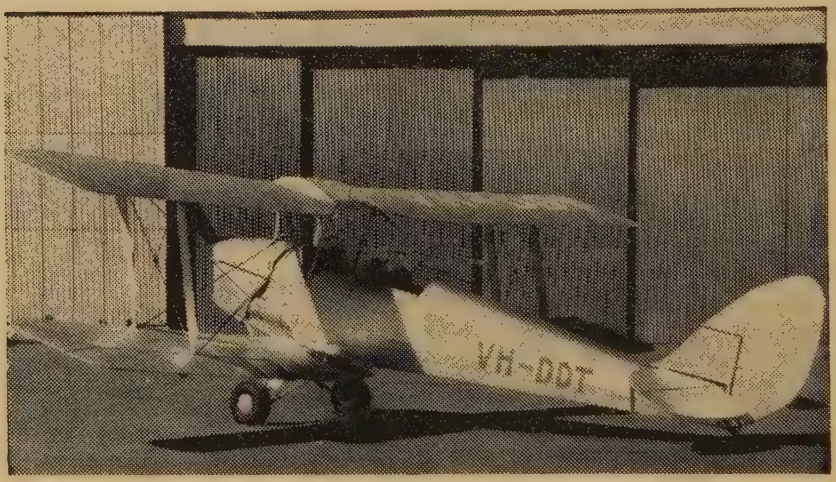

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POISON Plants OF WESTERN AUSTRALIA

C. A. GARDNER,
(Government Botanist) and H. W. BENNETTS, D.V.Sc. *(Principal, Animal Health and Nutrition Laboratories)*

THE TOXIC PLANTS OF THE GENERA GASTROLOBIUM AND OXYLOBIUM

SINCE the early days of settlement in Western Australia very heavy stock losses have resulted from the many poisonous species of the two closely related genera, Gastrolobium and Oxylobium which, with two exceptions, are widely distributed throughout the southern areas of the State. They constitute the largest groups of native poisonous plants and have been responsible for a large proportion of the economic losses due to plant poisoning.

In all cases the flowers and seeds are highly poisonous and are almost invariably the most dangerous parts of the plant. The leaves, except when young, are usually harsh and unpalatable and in addition are less toxic. The degree of toxicity of all parts of the plant, however, varies considerably with the species. The seedlings of many species such as Box Poison *(Oxylobium parviflorum)* are highly poisonous whereas others such as York Road Poison *(Gastrolobium calycinum)* may be grazed with impunity. The latter species, however, is said to be dangerous at most other stages of growth. Suckers of many species are dangerous. Our knowledge of variations of toxicity is still incomplete but in general it would appear that the parts of the plant most palatable to stock are the ones which are most highly poisonous.

ANIMALS POISONED

Sheep, cattle and horses are commonly killed by ingestion of these plants, but there is no doubt that native animals and birds eat leaves, flowers and seeds of poisonous species without harmful effect; such material has often been collected from the stomachs of marsupials and from the crops of birds. Numerous cases are on record where dogs and cats eating viscera from the native animals and bronze-winged pigeons have been poisoned, the symptoms shown being similar to those shown by poisoned sheep and cattle. Wild horses (brumbies) are said to be markedly resistant to the effects of the poisoning although they may succumb if over-driven.

Attempts have been made by Bennetts in this State to induce immunity in sheep by the administration of graded doses of extracts of toxic species but with negative results.

SYMPTOMS

Signs of heart and respiratory distress are invariably marked. A weak, accelerated heartbeat appears to be the first sign and this is usually accompanied by rapid breathing which may

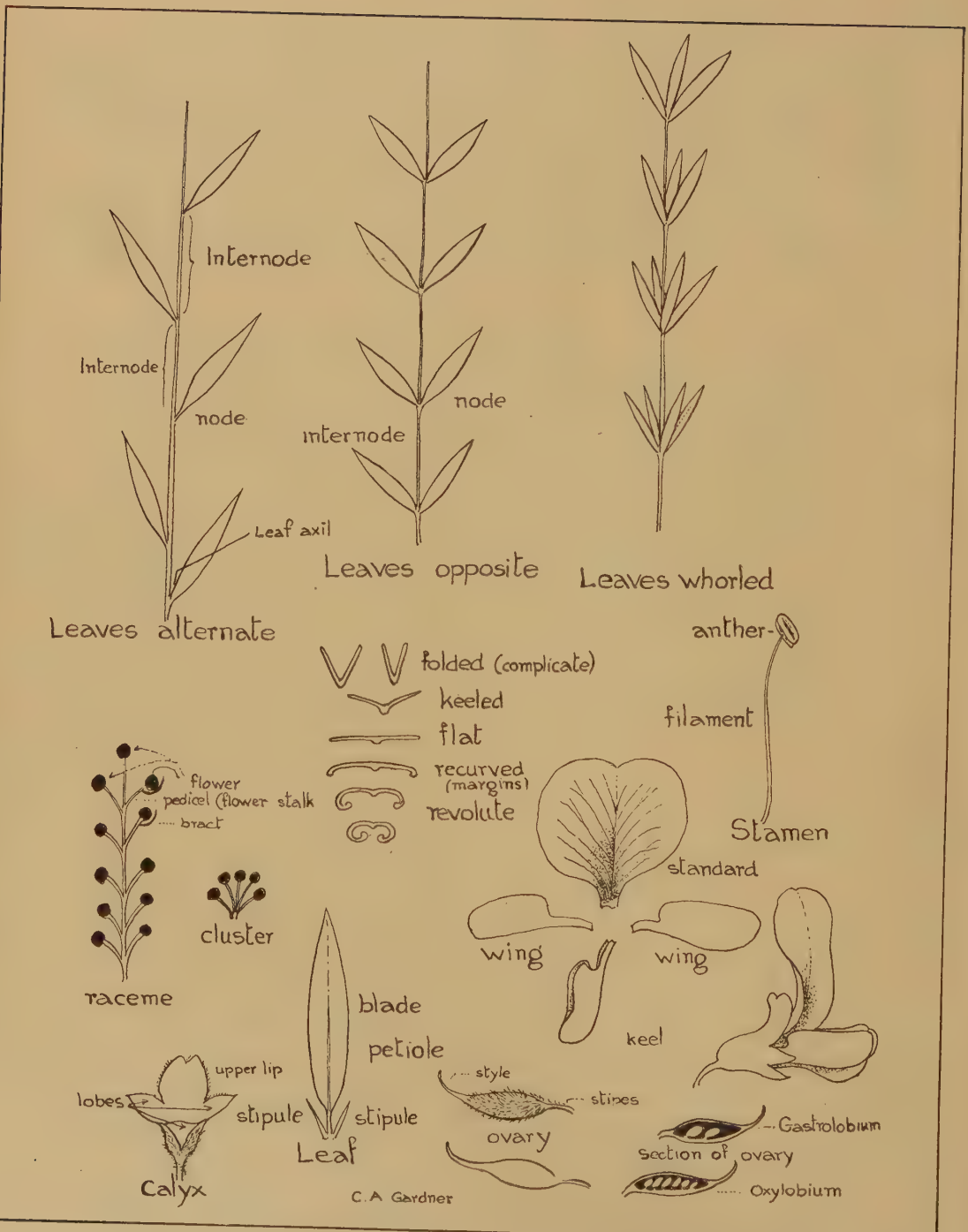

Plate 1.
Illustrating the parts of the plants and the terms used in the text.

increase to 200 a minute or more, the respiration becoming noisy and panting. Flecks of bloodstained froth may appear in the mouth following bleeding from the lungs and a few ounces of blood may exude from the mouth and nostrils. Driving increases the respiratory distress and may cause death within a few minutes. Frequency of urination is a fairly constant sign of poisoning.

Sheep which may have been grazing on poison country without exhibiting any ill effects may show severe symptoms if disturbed by dogs or if rounded up to be driven to other pastures.

Symptoms may vary from pronounced excitability and muscular spasms with stamping of the feet and twitching of ears and eyelids to signs of depression and muscular weakness. In the latter case the animal remains dull and the spasms are absent.

When standing the sheep may adopt a dejected humped attitude with the nose sometimes almost touching the ground. Following this, when let out of a pen for instance the animal may brighten up and walk or run away with the head held high. The feet are lifted high in running and the hind legs are straddled. After proceeding for 50 yards or so the sheep stands in the characteristic dejected attitude and will not move even if prodded. An affected sheep often lies down and appears partially paralysed.

Death may occur within several hours but is frequently delayed for one to four days.

IDENTIFICATION

About 50 distinct plants are attributed to the genera Gastrolobium and Oxylobium, of which 30 are known to be poisonous, the remainder as far as we know being harmless. These two genera belong to the pea-flowered, pod-bearing family Papilionaceae, easily recognised by their flowers. The toxic species have certain features in general, some of which may require a lens for their examination because of minute structures, others are easily discernible in the field. Farmers should pay particular attention to the following points, since they are thereby enabled to decide whether or not a plant is a poison plant, or should be regarded with suspicion, when stock losses are sustained. Although these points are not entirely reliable, they serve in most instances to distinguish the toxic pea-flowered shrubs of South Western Australia from those which are harmless.

1. All are shrubs, i.e., they branch close to the ground level and have woody stems. Most are under five feet in height, exceptions being Box poison (in some cases), Heart-leaved poison, and some forms of Prickly poison, which may attain a height of up to ten feet.

2. The leaves are opposite to each other along the branches, i.e., the leaves are on opposite sides of the stem, but each pair arises at the same level, or three or four leaves arise from the same level. The exceptions are Phillips River poison, Rock poison and Berry poison, but in these, especially in the first two, the leaves are densely crowded. In Box poison the leaves are sometimes scattered, but this arrangement is rare, and typically Box poison leaves are opposite or in threes.

3. There are two small organs at the base of the leaves called stipules, arranged one on each side of the leaf-stalk. In the poison plants these stipules are fine and hair-like or bristle-like with the exception of Mallet poison and Gilbernine poison, in which they are flat, lance-shaped, rigid, and joined to the leaf-stalk in the lower parts. Otherwise the stipules are distinct from the leaf-stalk, and lose their fine points when old.

4. The flowers are terminally arranged at the ends of the branches in racemes which resemble loose spikes, usually of a length exceeding that of the leaves. Occasionally these "spikes" also originate from the leaf bases along the stems. In Heart-leaved poison and Phillips River poison the "spikes" may be short and broad.

5. The calyx is unequally divided; of the five divisions, the two which lie behind the large upright petal (standard) are more united than the three lower divisions. In addition there are small brown leaf-like organs below each flower, known as **bracts**, which are thin and chaffy, and always fall before the flower is fully expanded.

6. The corolla (coloured part of the flower—the petals) is usually yellow or orange, rarely almost red in Crinkle-leaved poison and Net-leaved poison, and reddish towards the base with usually reddish radiating lines.

7. The ten stamens are all distinct and separate (they are never united, even in part).

8. The ovary (immature pod seen in the flower) is silky-hairy, hairy, or almost woolly, never devoid of hairs, although the pod may become hairless at maturity. In **Oxylobium** there are four to eight ovules (immature seeds) in the ovary, and in **Gastrolobium** constantly two. There may be fewer seeds in the pod than there are ovules in the ovary. This difference in the number of ovules is the sole character which separates the toxic species of **Gastrolobium** and **Oxylobium.**

DISTRIBUTION

With the single exception of Wallflower poison, which is tropical in distribution, the species are confined to Western Australia, and all of them south of the Gascoyne River. They may be arranged according to areas as follows:—

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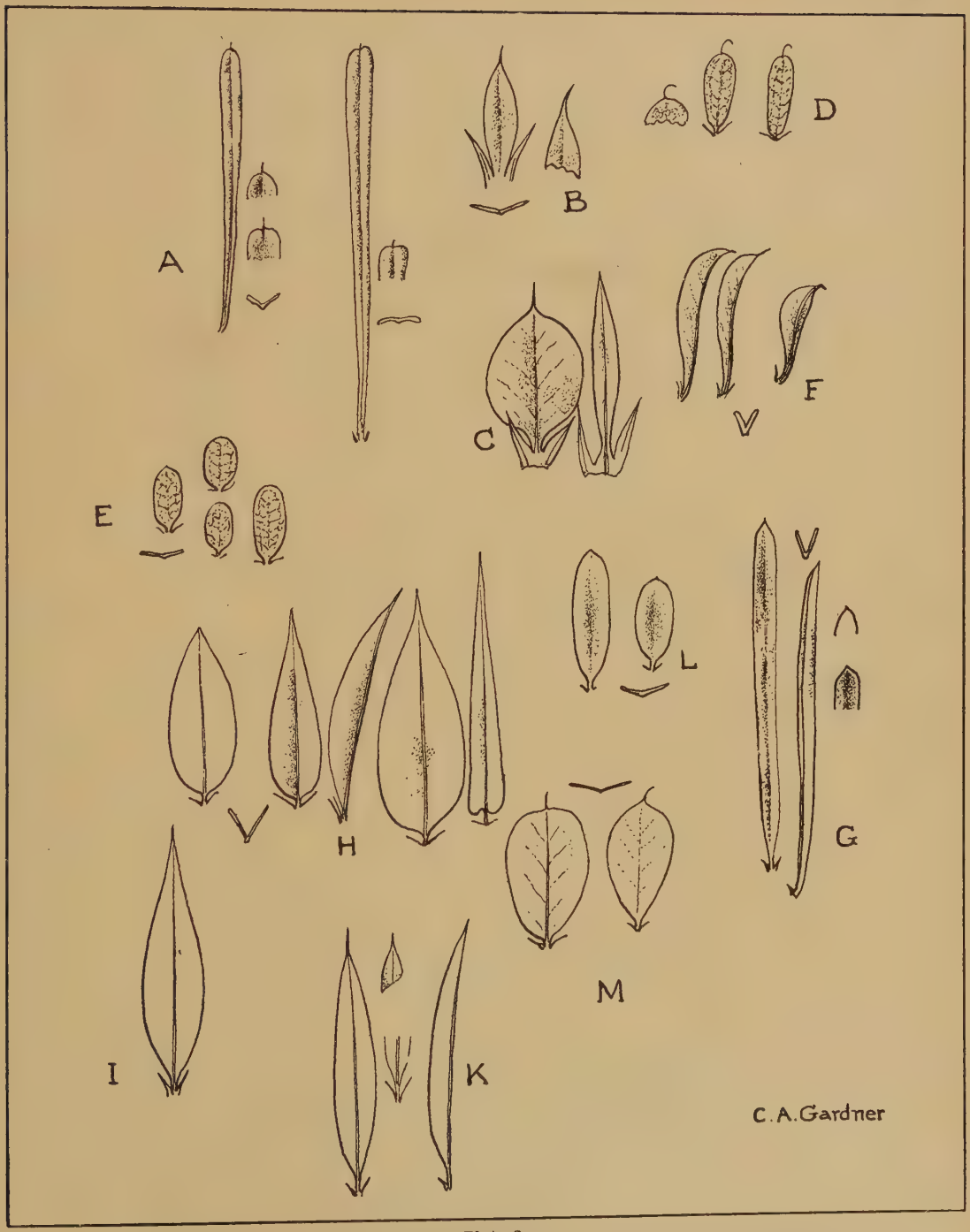

Plate 2.

GASTROLOBIUM: A, **PHILLIPS RIVER POISON** (G. stenophyllum, Turcz); B, **MALLET POISON** (G. densifolium, C. A. Gardn.); C, **GIBERNINE POISON** (G. rotundifolium, Meissn); D, **HOOK-POINT POISON** (G. hamulosum, Meissn); E, **BERRY POISON** (G. parrifolium Benth.); F, **CLUSTER POISON** (G. Bennettsianum, C. A. Gardn.); G, **WODJIL POISON** (G. floribundum, S. Moore); H, **YORK ROAD POISON** (G. calycinum, Benth); I, **SANDPLAIN POISON** (G. microcarpum, Meissn); K, **CHAMPION BAY POISON** (G. oxylobioides, Benth); L, **NARROW-LEAVED POISON** (G. crassifolium, Benth); M, **WONGAN POISON** (G. glaucum, C. A. Gardn.); N, **ROCK POISON** (G. callistachys, Meissn).

A. Kimberley Division, north of the King Leopold Range, also Mount Anderson, and the Hamersley Range, south from Roebourne :
WALLFLOWER POISON (Gastrolobium grandiflorum *F. Muell.*).

B. Murchison district and eastwards to Wiluna, southwards to Payne's Find and the Ninghan Hills, also at Latham
BREELIA OR KITE-LEAVED POISON (Gastrolobium Laytonii *Ewart & White*).

C. Eastern Goldfields :

Granite outcrops near Coolgardie :
GRANITE POISON (Oxylobium graniticum *S. Moore*).

Occurring variously :
BOX POISON (Oxylobium parviflorum *Benth.*).

Gravelly sandplain and Wodjil country :
WODJIL POISON (Gastrolobium floribundum *S. Moore*).

D. South-West Division :

a. Coastal plain and Darling escarpment (northwards from Pinjarra):

Sandplain and gravelly plain with a clay subsoil :
CHAMPION BAY POISON (Gastrolobium oxylobioides *Benth.*)

Granite country :
YORK ROAD POISON (Gastrolobium calycinum *Benth.*).
ROCK POISON (Gastrolobium callistachys *Meissn.*).

Gravelly clay soil :
WANDOO POISON (Gastrolobium polystachyum *Meissn.*).
HILL RIVER POISON (Gastrolobium bidens *Meissn.*).
PRICKLY POISON (Gastrolobium spinosum *Benth.*).

b. Wandoo and Mallet areas of the Great Southern District :

Sand plain :
SANDPLAIN POISON (Gastrolobium microcarpum *Meissn.*).
PRICKLY POISON (Gastrolobium spinosum *Benth.*).
YORK ROAD POISON (Gastrolobium calycinum *Benth.*).

Loamy soils, sometines granitic :
BOX POISON (Oxylobium parviflorum *Benth.*).
GILBERNINE POISON (Gastrolobium rotundifolium *Meissn.*).
BULLOCK POISON (Gastrolobium trilobum *Benth.*).
PRICKLY POISON (Gastrolobium spinosum *Benth.*).
RUNNER POISON (Gastrolobium ovalifolium *Henfr.*).

Granite outcrops :
HEART-LEAVED POISON (Gastrolobium bilobum *R. Br.*).
ROCK POISON (Gastrolobium callistachys *Meissn.*).

Gravelly loamy soils :
MALLET POISON (Gastrolobium densifolium *C. A. Gardn.*).
BOX POISON (Oxylobium parviflorum *Benth.*).
GILBERNINE POISON (Gastrolobium rotundifolium *Meissn.*).
PRICKLY POISON (Gastrolobium spinosum *Benth.*).

c. Jarrah and Wandoo country of the Darling Range :

Gravelly soil, also granitic soil :
CRINKLE-LEAVED POISON (Gastrolobium villosum *Benth.*).
PRICKLY POISON (Gastrolobium spinosum *Benth.*).
YORK ROAD POISON (Gastrolobium calycinum *Benth.*).
SANDPLAIN POISON (Gastrolobium microcarpum *Meissn.*).

d. Wheat belt :

Sandplain, heath and gravelly wodjil soils :
PRICKLY POISON (Gastrolobium spinosum *Benth.*).
WODJIL POISON (Gastrolobium floribundum *S. Moore*).
CLUSTER POISON (Gastrolobium Bennettsianum *C. A. Gardn.*).
SANDPLAIN POISON (Gastrolobium microcarpum *Meissn.*).
NARROW-LEAVED POISON (Gastrolobium crassifolium *Benth.*).
BERRY POISON (Gastrolobium parviflorum *Benth.*) (Greenhills and Brookton to Kellerberrin).
HOOK-POINT POISON (Gastrolobium hamulosum *Meissn.*) (Calingiri to Wongan Hills).
WONGAN POISON (Gastrolobium glaucum *C. A. Gardn.*).

Granite outcrops :
ROCK POISON (Gastrolobium callistachys *Meissn.*).
BREELYA OR KITE-LEAVED POISON (Gastrolobium Laytonii *Ewart & White*) (Latham district only).
BOX POISON (Oxylobium parviflorum *Benth.*).

Clay or loamy soils :
GILBERNINE POISON (Gastrolobium microcarpum *Meissn.*).
BOX POISON (Oxylobium parviflorum *Benth.*).
CLUSTER POISON (Gastrolobium Bennettsianum *C. A. Gardn.*).

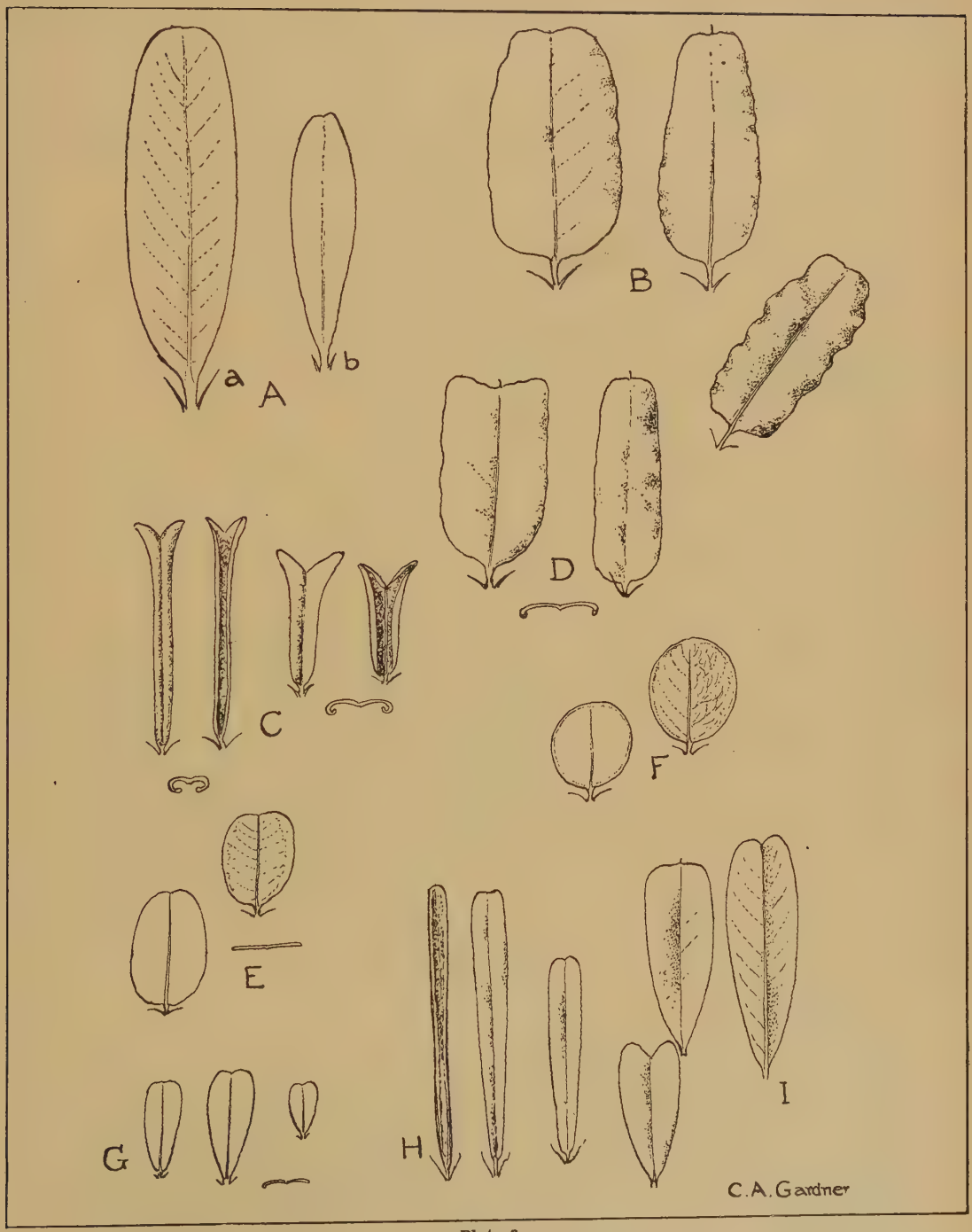

Plate 3.

GASTROLOBIUM: A, **WALLFLOWER POISON** (G. grandiflorum, F. Muell) (a, the typical form from North Kimberley; b, the form from the Hamersley Range); B, **CRINKLE-LEAVED POISON** (G. villosum, Benth); C, **HILL RIVER POISON** (G. bidens, Meissn); D, **WANDOO POISON** (G. polystachyum, Meissn); E, **MOUNT RAGGED POISON** (G. pycnostachyum, Benth); F, **RUNNER POISON** (G. ovalifolium, Henfr.); G, **STIRLING RANGE POISON** (G. velutinum, Lindl); H, **RIVER POISON** (G. Forrestii, Ewart); I, **HEART-LEAVED POISON** (G. bilobum, R. Br.).

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5SNP	5ft.	18-27
4HMP	4ft.	28-36
5HMP	5ft.	31-42
6HMP	6ft.	37-51

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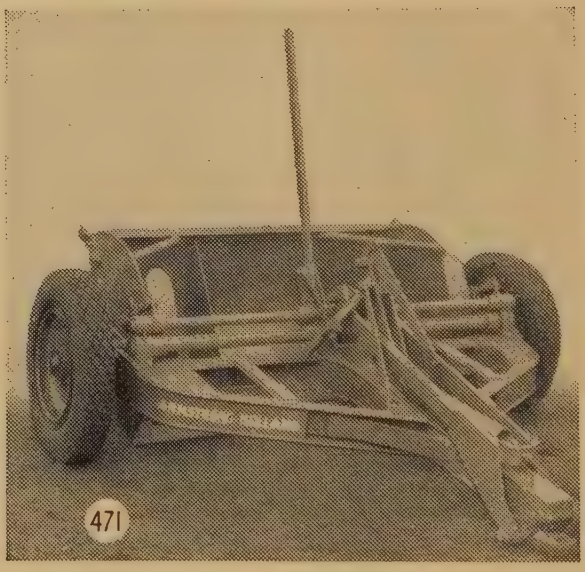

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e. South coastal district ; lower Jarrah forest, Karri forest and the south coastal districts from Albany to Israelite Bay, as far north as Tambellup, Ravensthorpe and Salmon Gums :

Granite soils :

HEART-LEAVED POISON (Gastrolobium bilobum *R. Br.*).
BROTHER-BROTHER (Oxylobium tetragonophyllum *E. Pritzel*) (Ravensthorpe district only).
NET-LEAVED POISON (Oxylobium racemosum (*Turcz.*) *C. A. Gardn.*).
BOX POISON (Oxylobium parviflorum *Benth.*).

Quartzite and sandstone hills :

STIRLING RANGE POISON (Gastrolobium velutinum *Lindl.*).
PRICKLY POISON (Gastrolobium spinosum *Benth.*).
MOUNT RAGGED POISON (Gastrolobium pycnostachyum *Benth.*).
PHILLIPS RIVER POISON (Gastrolobium stenophyllum *Turcz.*).

Sandheaths (often gravelly) :

STIRLING RANGE POISON (Gastrolobium velutinum *Lindl.*).
NARROW-LEAVED POISON (Gastrolobium crassifolium *Benth.*).
PRICKLY POISON (Gastrolobium spinosum *Benth.*).

Watercourses :

RIVER POISON (Gastrolobium Forrestii *A. J. Ewart*).
SOUTH COAST GULLY POISON (Oxylobium heterophyllum *Benth.*).
BOX POISON (Oxylobium parviflorum *Benth.*)—a narrow-leaved form.

KEY TO THE SPECIES

(Based on leaves and habit of growth.)

A. Leaves not toothed.

B. Leaves all or mostly irregularly arranged, scattered or alternate, never strictly opposite, usually crowded along the branches.

C. Leaves very narrow, densely crowded, V-shaped in section, usually alternate :
PHILLIPS RIVER POISON (G. stenophyllum *Turcz.*).

C. Leaves flat or the margins curved downwards (recurved).

D. Leaves narrow, 1–2 inches long ; racemes elongated (*i.e.*, the flowers in long "spikes") :
ROCK POISON (G. callistachys *Meissn.*).

D. Leaves oblong to narrowly oblong, convex underneath, concave above, less than half an inch long :
BERRY POISON (G. parvifolium *Benth.*).

B. Leaves strictly opposite each other, or in threes or fours arising in whorls, from the same position on the branch or stem.

C. Stipules broad at the base, lance-shaped, membranous, produced into a fine tapering point, the lower part persistent and attached to the leaf-stalk.

D. Leaves thick, crowded, without any hairs, less than half an inch long, lance-shaped :
MALLET POISON (G. densifolium *C. A. Gardn.*).

D. Leaves not thick and rigid, not crowded, cobwebby-hairy underneath, half to one inch long and typically broad :
GILBERNINE POISON (G. rotundifolium *Meissn.*).

C. Stipules hair or bristle-like, usually inconspicuous, not persistent.

D. Leaves small, rather broad, obtuse with a fine but small bristle-like distinctly hooked point, the leaf less than half an inch long :
HOOK-POINT POISON (G. hamulosum *Meissn.*).

D. Leaves mostly longer than half an inch, acute, obtuse or notched at the apex, never obtuse with a small hooked hair-like or bristle-like point.

E. Leaves terminating in a sharp pungent point, either tapering gradually into the point, or abruptly narrowed towards the tip into a short rigid straight or curved point.

F. Leaves somewhat rigid, abruptly narrowed into a rigid point, either concave or keeled ; stems reddish-yellow.

G. Leaves less than one inch long, somewhat curved and spreading outwards from the stem, usually dense :
CLUSTER POISON (G. Bennettsianum *C. A. Gardn.*).

G. Leaves above three-quarters of an inch long, narrow and rigid, not curved, erect.

H. Leaves mostly in pairs, mostly 2 inches long, deeply concave or V-shaped, yellowish-green :
WODJIL POISON (G. floribundum *S. Moore*).

H. Leaves mostly in threes, less than one inch in length.

I. Leaves concave, thick, obtuse :
NARROW-LEAVED POISON (G. crassifolium *Benth.*).

I. Leaves flat, obtuse, but with a fine straight point at the blunt apex :
WONGAN POISON (G. glaucum *C. A. Gardn.*).

F. Leaves not very rigid, glaucus (blue-green), usually tapering into a pungent point, or if abruptly contracted, the point slender.

G. Leaves rounded or indented (heart-shaped) at the base, flat or concave ; flowers large, the calyx hairless :
YORK ROAD POISON (G. calycinum *Benth.*).

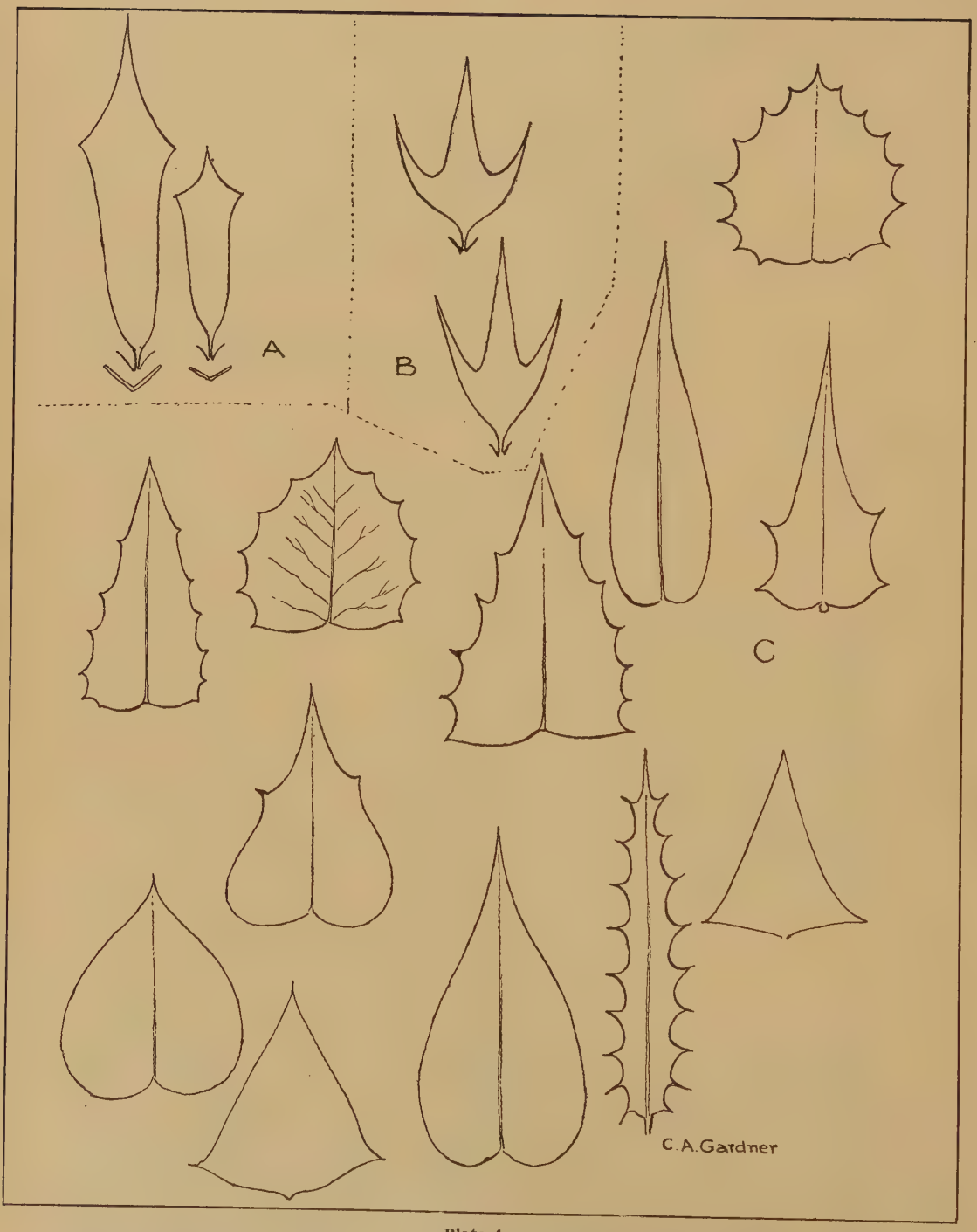

Plate 4.

GASTROLOBIUM: A, **BREELYA** or **KITE-LEAVED POISON** (G. Laytonii, Ewart & White); B, **BULLOCK POISON** (G. trilobum, Benth); C, forms of **PRICKLY POISON** (G. spinosum, Benth).

G. Leaves tapering into the leaf-stalk ; flowers small, the calyx hairy.

H. Leaves spreading, green above, paler underneath, gradually tapering into a fine sharp point :

SANDPLAIN POISON (G. microcarpum *Meissn.*).

H. Leaves somewhat erect, glaucous or yellowish, the same colour on both surfaces, usually abruptly contracted into a fine point, sometimes tapering at the apex :

CHAMPION BAY POISON (G. oxylobioides *Benth.*).

E. Leaves obtuse or notched at the apex.

F. Tropical species :

WALLFLOWER POISON (G. grandiflorum *F. Muell.*).

F. South-Western and Goldfields species.

G. Leaves with undulated or crisped margins.

H. Trailing shrub ; flowers red, in elongated racemes much exceeding the leaves :

CRINKLE-LEAVED POISON (G. villosum *Benth.*).

H. Erect shrubs with much branched stems ; flowers yellow suffused with red ; racemes of flowers only slightly exceeding the leaves.

I. Leaves almost flat :

WANDOO POISON (G. polystachyum *Meissn.*).

I. Leaves with much recurved or revolute (rolled under) margins, typically 2-horned at the tip :

HILL RIVER POISON (G. bidens *Meissn.*). (Intermediate forms between Wandoo and Hill River poisons occur.)

G. Leaves without undulate margins, either flat, more or less folded, or the straight margins rolled underneath (revolute).

H. Leaves almost round, about as broad as long, broad at the base.

I. Leaves obtuse at the base and apex.

K. Prostrate or trailing shrub ; racemes slender and elongated ; typically a hairy plant :

RUNNER POISON (G. ovalifolium *Henfr.*).

K. Erect shrub with stiff wiry branches ; racemes short and compact :

MT. RAGGED POISON (G. pycnostachyum *Benth.*).

I. Leaves contracted or shortly tapering into a fine stiff pungent spine at the apex, indented at the base :

PRICKLY POISON (G. spinosum *Benth.*).

H. Leaves longer than broad, or if as broad as long then tapering at the base.

I. Leaves commonly in clusters of 3 or 4, wedge-shaped (*i.e.*, broadened towards the apex), the apex notched, the margins recurved or rarely flat, stems acutely angled.

K. Leaves mostly in threes, rigid, less than 1 inch long.

L. Leaves concave, quite hairless :

NARROW-LEAVED POISON (G. crassifolium *Benth.*).

L. Leaves flat or with recurved margins, usually silky hairy or pubescent underneath :

STIRLING RANGE POISON (G. velutinum *Lindl.*).

K. Leaves mostly in fours, 1–2 inches long, or if shorter then thin and not rigid :

RIVER POISON (G. Forrestii *Ewart*).

I. Leaves in pairs (or in *G. crassifolium* sometimes in threes), not wedge-shaped and not notched at the apex except in Brother-Brother, but then the leaf with parallel sides.

K. Leaves thick and rigid, pale or glaucous, smooth, thick, concave, hairless :

NARROW-LEAVED POISON (G. crassifolium *Benth.*).

K. Leaves flat or with recurved (rolled downwards) or revolute margins.

L. Leaves hairy or silky on the lower side, the margins recurved or revolute.

M. Leaves very thick, deeply notched at the base and apex, the margins strongly recurved, densely velvety or woolly underneath, the leaves mostly directed downwards from the stem :

BROTHER-BROTHER (G. tetragonophyllum *E. Pritzel*).

M. Leaves erect or spreading, never reflexed, silky or finely and short hairy underneath, not notched at the base.

N. Stipules fine and conspicuous ; leaves thin, loosely and sparsely hairy on the lower side, especially on the midrib, the hairs spreading.

SOUTH COAST GULLY POISON (G. heterophyllum [*Turcz.*] *Benth.*).

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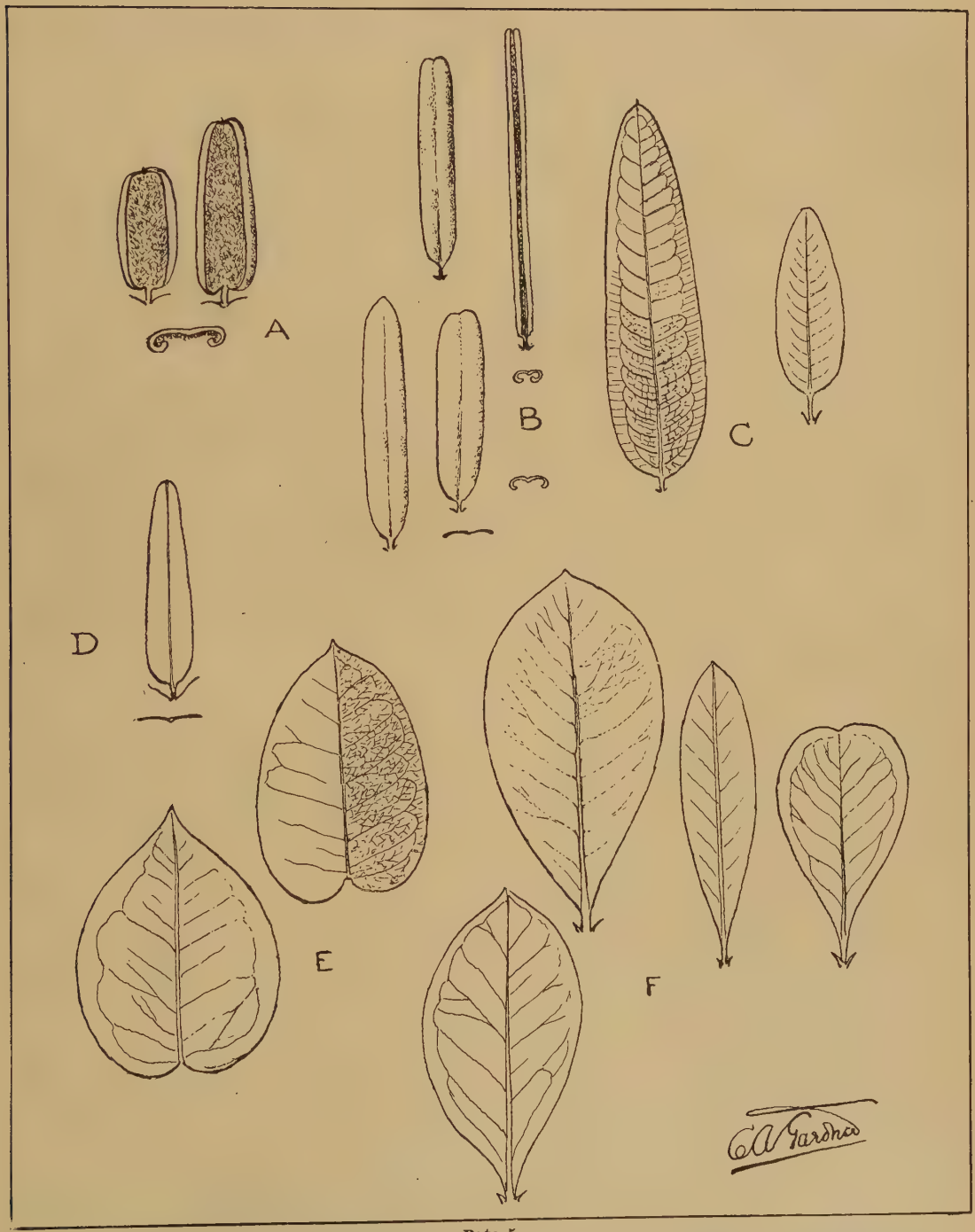


Pate 5.

OXYLOBIUM: **A, BROTHER-BROTHER** (O. tetragonophyllum, **E.** Pritzel); **B, BOX POISON** (O. parviflorum, Benth); **C, NET-LEAVED POISON** (O. racemosum (Turcz), C. A. Gardn); **D, SOUTH COASTAL GULLY POISON** (O. heterophyllum, Benth); **E, MUNTADGIN POISON** (O. spectabile Endl.); **F, GRANITE POISON** (O. graniticum, S. Moore).

N. Stipules inconspicuous ; leaves rather thick, the margins varying from almost flat or slightly recurved to closely revolute, and then the under surface invisible, yellowish with short appressed hairs underneath.

BOX POISON (O. parviflorum *Benth.*).

L. Leaves hairless (glabrous) when full grown, quite flat and prominently net-veined.

M. Leaves notched at the base ; bracteoles toothed or 3-pronged :

MUNTADGIN POISON (O. spectabile *Endl.*).

M. Leaves not notched at the base ; bracts not toothed.

N. Leaves broad, tapering into the leaf-stalk ; flowers large, yellow :

GRANITE POISON (O. graniticum *S. Moore*).

N. Leaves narrow, oblong or oval, obtuse at the base ; flowers reddish :

NET-LEAVED POISON (O. racemosum [*Turcz.*] *C. A. Gardn.*).

A. Leaves toothed or lobed.

B. Leaves typically kite-shaped, *i.e.*, the greater and lower part wedge-shaped, the upper part triangular or very blunt, typically with two lateral teeth or points above the middle and horizontally spreading :

BREELYA OR KITE-LEAVED POISON (G. Laytonii *Ewart & White*).

B. Leaves not kite-shaped, if triangular the lateral points below the middle or diverging from the base.

C. Leaves flat, hairless.

D. Leaves deeply divided into three narrow pungent-pointed teeth or lobes all projecting forwards ; flowers mostly in clusters in the leaf-axils. ? toxic :

BULLOCK POISON (G. trilobum *Benth.*).

D. Leaves variously toothed, but when 3-lobed or 3-toothed, the two lateral teeth not deeply divided off from the leaf, and always laterally spreading ; racemes mostly terminal :

PRICKLY POISON (G. spinosum *Benth.*).

C. Leaves with the margins closely rolled underneath, wedge-shaped, with usually two short teeth at the apex forming two cusps, or the leaf very obtuse or truncate, densely hairy underneath :

HILL RIVER POISON (G. bidens *Meissn.*).

PALATABILITY AND TOXICITY

Fully developed plants are not as a rule attractive to grazing animals and the major risks are those encountered with hungry travelling stock which sometimes die in large numbers. In the natural pasture many of the plants are avoided by stock because of their harsh or prickly nature. The fact that the flowers and seeds are the most highly toxic parts is interesting when it is considered that the toxic plants of both genera are only those in which the racemes are terminal and project beyond the foliage.

Because of this, the seeds, which are sometimes produced in abundance, are easily available to stock. Sheep, especially during the summer months, may find the seeds attractive and may eat them by nipping them off the plants or eating them from the ground.

Although the adult foliage is hard and unpalatable, the seedlings are of much softer texture. When seedlings appear after bushfires they are apt to be devoured greedily by all classes of stock and heavy mortalities occur.

CONTROL

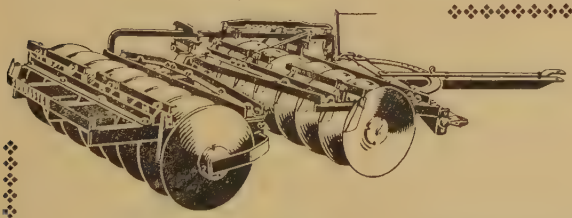
All of the toxic species of the genera *Gastrolobium* and *Oxylobium*, as far as we know, can be destroyed by cutting at the ground level, with the exception of Wodjil poison, Cluster poison, York Road poison and Champion Bay poison. These plants sucker freely, and require to be grubbed. When grubbing, if the resultant excavation is left open, the roots remaining in the soil will produce suckers if their ends are exposed, and thus it is important that the excavation be filled and the filling compacted. When this is done there is less risk of these particular species producing suckers. The poison plants of these genera are a problem almost

peculiar to Western Australia, and with the exception of the few species which occur in sandy gravelly open country, such as Berry poison, Hook-point poison and Champion Bay poison, the types of country most notorious in this respect are the Wandoo (white gum) and Mallet country of South-Western Australia. This is usually regarded as "poison country." In addition there are a number of plants which are more or less restricted to granite rocks, especially in the wheat areas, and a search should always be made for the plants which might occur in such situations.

Cultivation, where possible, is the best method of destruction. Under natural conditions, the plants usually occur scattered through country carrying other shrubs some of whch are not unlike the toxic species. Individual treatment, such as pulling, may result in certain plants being overlooked, but with cultivation everything is destroyed. It must be remembered, however, that a feature of these plants is the longevity of their seeds, and there is always the risk of young plants appearing after the initial destruction.

Fire induces germination. Following clearing and burning, the land should be cropped, and after harvesting the stubble should be burned, preferably by means of a slow fire on a calm day. The following season the land should be cultivated, cropped and again burned, repeating the performance if necessary for a third time. By then most of the seeds in the soil will have germinated, and thereafter there is little risk of subsequent poisoning. At the same time it pays to be vigilant, especially in those places where cultivation has not been performed, such as the margins of paddocks.

Where clover pasture is intended there is not the same risk, for the seedlings come up with the clover and are usually eaten before they have attained any size, and thus there is little material ingested, together with the fact that a dense stand of clover does much to suffocate the young poison plants through competition.



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POISON SEDGE AND CYANOGENESIS

R. D. ROYCE, B.Sc. (Agric.), Botanist

DURING the afternoon of April 14 of this year, a flock of 800 sheep on a property in the Carnamah district was turned into an old stubble paddock which had been spelled for two months, after having carried the same sheep for the previous six months. The following day more than 200 sheep were found dead in the paddock, death having apparently occurred suddenly and without any struggling. The rapidity and severity of the losses, together with the lack of observed symptoms, suggested that the trouble had been due to a cyanogenetic plant (a plant capable of killing stock by the liberation of prussic acid after ingestion.)

The paddock in which these losses occurred is typical of the undulating sandplain country to the west of Carnamah. The natural vegetation is a stunted association of a great variety of species, with occasional taller shrubs and trees, the soil being of a light sandy nature. The depressions retain a certain amount of moisture during the summer months and usually carry a cover of green plants.

The majority of the dead sheep were found within a relatively small portion of the paddock, and when this area was inspected it was found that one depression contained a vigorous stand of a dark green, grass-like plant, the greater part of which had been eaten down to ground level. This was the so-called Poison Rush or Poison Sedge, a species of *Schoenus,* a plant which has long been looked on with suspicion, but has only recently been definitely established as a cyanogenetic plant.

Fig. 1—Poison Sedge, showing condition of active growth in autumn.

DESCRIPTION

Poison Sedge is a tussocky, grass-like plant, growing in clumps of up to three inches in diameter at the base, with a vigorous fibrous rooting system. The

leaves are up to ten inches in length, dark glossy green in colour, smooth and flat, although usually rolled or folded. Each leaf is expanded into a broad open sheathing base, marked by numerous parallel veins and with a reddish colouration in the lower half. This is the character which can be most readily used in the vegetative condition for distinguishing between this plant and the true grasses, none of which has an open sheathing base similar to that of Poison Sedge, which is illustrated in Fig. 2.

Fig. 2.—Lower portion of plant, showing the broad sheathing base of the leaves and their reddish colouration in the lower half.

Flowering culms (or stalks) develop from the crown during the winter months and attain a height of 15 to 18 inches. The culms are leafless, and bear a number of spikelets or clusters of flowers at their extremities. Each spikelet is surrounded by a number of reddish-brown bracts, similar in nature to the husk of oats, the apex of each of the outermost bracts being abruptly contracted into a leaf-like appendage. When the bracts fall from the culm after the seeds have matured, the characteristic zig-zag structure of the central axis of the spikelet is seen. A flowering plant is illustrated in Fig. 3.

NOT MANY SPECIES

The number of cyanogenetic plants in Western Australia is not very great, but most are capable of causing heavy stock losses. Unlike the native poison plants of the genera *Gastrolobium* and *Oxylobium,* cyanogenetic plants vary in toxicity, and under certain circumstances can be harmless. As a general rule it may be stated that a high prussic acid content can be associated with vigorous growth, and this is true of seasonal growth in either autumn or spring, or of rapid regeneration after mechanical injury or following fires.

No plants have been shown to contain free prussic acid, and so be capable of producing death of itself. The acid is always found in plant tissues combined with sugars in the form of glucosides, and in this form it is not poisonous. If, however, glucoside comes in contact with a substance known as an enzyme, which is capable of breaking it up into its constituent parts, free prussic acid is liberated, and death can be caused if there is sufficient of the acid present. It is essential that these two substances, glucoside and enzyme, should be present before prussic acid poisoning will occur. In some plants the two substances are always associated, so that when conditions are favourable to the formation of the glucoside, the enzyme is also formed and the plant immediately becomes

toxic. On the other hand, only one of the substances may be produced by the plant. Any such plant of itself would be harmless, but if two plants were eaten by an animal, one containing a glucoside, and the other an enzyme capable of reacting with that glucoside, the animal would be killed if there was sufficient of the poison in the first plant. It is interesting to note that some species of wattles are known to possess toxic properties if eaten in association with certain other species of plants.

DENSITY IS IMPORTANT

This distribution of glucoside and enzyme within the tissue of these plants at different stages of growth, as well as their distribution in nature, provides only one of the factors which are known to affect the ultimate toxicity of cyanogenetic plants. Another factor is the density of the stand of the toxic plant. In the paddock referred to above, if the plants of Poison Sedge had been scattered evenly over the whole of the 2,000 acres, instead of being concentrated in approximately one acre, the losses would probably have been negligible. Even if a vigorous stand of nutritious pasture species had been growing with the rush, it is probable that losses would have been less severe, as the animals would each have eaten less of the toxic plant.

The relative quantities of glucoside and enzyme within a plant is another important consideration. While it may be interesting to know how much prussic acid can be liberated within the plant by the enzyme present, it is far more important to know the total amount of poison that can be produced if additional active enzyme is contained in some other fodder. Thus in Native *Fuchsia (Eremophila maculata* F. Muell) Hurst, in "Poison Plants of N.S.W.," reported that incubation of plant material for four hours liberated only 25% of the amount of prussic acid that could be liberated in the same time when the experiment was tried with additional enzyme. Such a plant, although it contains many times as much prussic acid as there is in sorghum, may actually prove less toxic in practice because the lack of enzyme in the tissue results in a slow liberation of the poison. With adequate enzyme intake in the fodder, it is thus the total glucoside content of the plant ingested, that would be the measure of its toxicity.

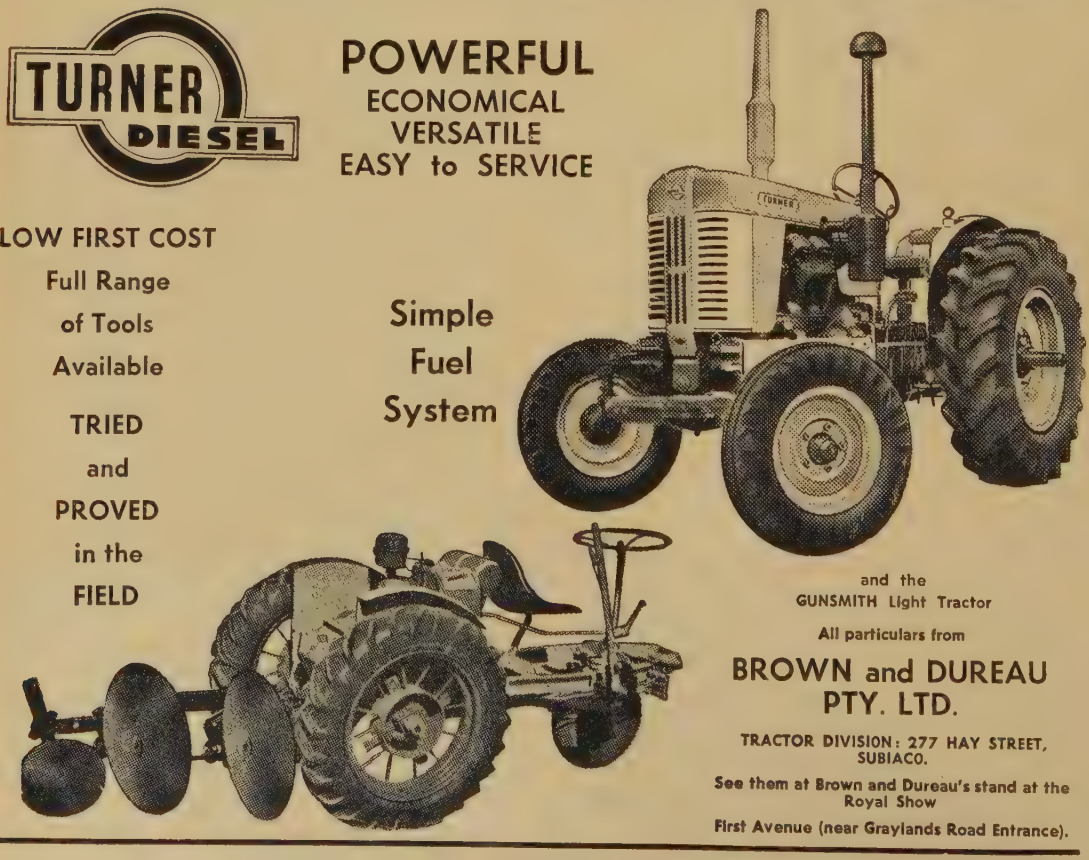
This concept of the speed of liberation of prussic acid is a fourth factor governing toxicity. Although the glucosides are readily broken down by

Fig. 3.—Flowering plant of Poison Sedge.

enzymes, the prussic acid so liberated may re-combine with other substances and once again become non-toxic. Thus in plants of low enzyme content, and providing no other source of enzyme is available, the rate of prussic acid liberated may be balanced by the rate at which it combines with other substances to form non-toxic compounds. Plants in which these reactions are balanced, would theoretically, be non-toxic. It is only when there is sufficient enzyme to ensure a rapid liberation of prussic acid, that the sudden onset of symptoms and severe losses so characteristic of prussic acid poisoning are seen.

The factors governing the poison potentiality of a plant are further complicated by the physical condition of the sheep themselves, particularly the question of hunger, while travelling stock are far more prone to the effects of poisonous plants than are paddock-grazing sheep. It is the inter-action of these numerous factors which causes the bewilderingly sudden onset of toxicity in cyanogenetic plants. The history of the Carnamah losses is typical of prussic acid poisoning: the sheep had been grazed for some time in the paddock, and then sudden severe losses occurred.

It is the sudden flush of potential toxicity which constitutes the menace of this type of plant, as where losses occur they are usually heavy. It is fortunate that, heavy though losses from these plants may be, the plants themselves are not as important economically as are the species of *Gastrolobium* and *Oxylobium*, but must always, however, remain a potential menace to the pastoral economy of this State.



PLANT DISEASES

ENTYLOMA LEAF SPOT OF ENGLISH MARIGOLD

By R. F. DOEPEL, B.Sc. (Agric.), Plant Pathologist

THE English marigold or calendula is a hardy ornamental which is widely grown in gardens throughout Western Australia. With the exception of eelworm attack on the roots it is seldom troubled by diseases and this feature has no doubt contributed to its popularity.

However, a new disease (caused by the fungus *Entyloma calendulae*) was recorded last year from a number of localities in W.A., including Perth, Forrestfield and Bindoon and may prove to be rather serious.

SYMPTOMS

Affected leaves develop pale yellow spots which increase in size up to one quarter of an inch in diameter. Such spots later become dark grey in appearance as the diseases progresses on the plant. (See illustration overleaf.)

The older leaves are the first to be attacked and during wet weather, which favours the disease, are often completely destroyed. As the season progresses infection spreads to the younger leaves also and the plants become very ragged in appearance and produce inferior blooms. With the advent of warm weather however, good recovery may be made.

CONTROL MEASURES

1. Adopt a rotation so that marigolds are grown in different sites in the garden each year.

2. As soon as the disease is noticed apply a copper-containing spray and repeat at weekly intervals if found necessary. Copper oxychloride sprays such as Cuprox, Soltosan, etc. are convenient to use and are often preferred in the home garden. They can be obtained from leading seedsmen and florists and should be used at strengths indicated by the makers.

3. At the end of the season all diseased plants and fallen leaves should be collected from the garden and burnt.

English marigold (Calendula) leaves showing typical symptoms of the Entyloma leaf spot disease.

HORMONE WEEDICIDE INJURY TO GRAPE VINES

Warning to Growers

By W. P. CASS SMITH, B.Sc. (Agric.), Government Plant Pathologist

During the present season, serious injury to grape vines from 2,4-D and 2,4,5-T, proprietary weedicides, has been noticed on two occasions. In each case the damage, which included killing of vines outright, was brought about by spraying weeds between the rows or on headlands.

The object of this note is to warn growers of the serious consequences which indiscriminate use of hormone weedicides may cause, and acquaint them with the more prominent symptoms noticed. (See illustrations.)

Wind transported spray particles, or volatile spray constituents, may cause damage not only at the place of application but also at considerable distances from the source. In addition the complete cleansing of spray outfits from hormone weedicides is difficult to achieve and injury may thus be caused by residues in the tank.

Before using hormone weedicides therefore, growers are strongly recommended to obtain advice from the Chief Weeds Control Officer regarding suitable materials and precautions to be observed.

SYMPTOMS OF HORMONE WEEDICIDE INJURY ON GRAPE VINES

Figs. 1 and 2.—Currant foliage from Bindoon, November, 1951, showing symptoms caused by a 2,4-D preparation applied for weed control during dormant period. Note for comparison healthy leaf at bottom of Fig. 2.

Fig. 3.—Wortley Hall and Ladies Finger canes from a West Midland garden, showing prominent multiple-bud galls and splitting of bark. Injury caused by 2,4,5-T.

Fig. 4.—White Chasselas fruit stalks from West Swan, March, 1952, showing damage caused by 2,4,5-T applied for weed control probably during the early growing season. Note gross thickening and cankering of fruit stalks and withering of berries. Leaf symptoms similar to those in Figs. 1 and 2 were also noticed.

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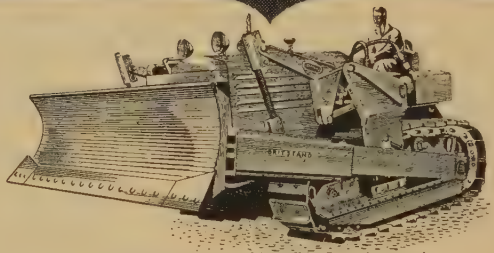

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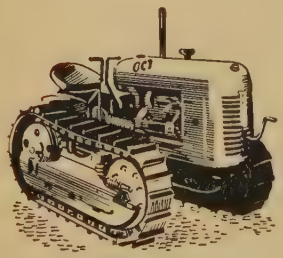

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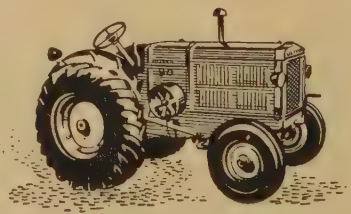

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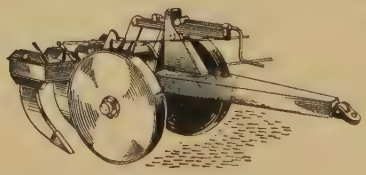

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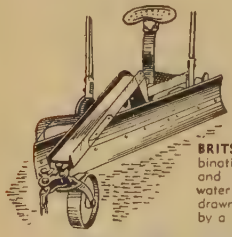

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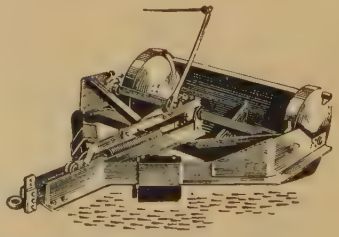

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LATE OR IRISH BLIGHT OF POTATOES

By W. P. CASS SMITH, B.Sc. (Agric.), Govt. Plant Pathologist

LATE or Irish Blight, caused by the fungus Phythophthora infestans, is the most destructive disease of potatoes in many countries. Fortunately it has proved to be uncommon in the main potato areas of Western Australia as suitable weather for its epidemic development seldom occurs for sufficiently long periods. The disease is encouraged by periods of warm muggy weather during the day, followed by relatively cool night temperatures.

Fig. 1.—Potato leaf showing symptoms of Irish Blight. (After K

In the past, serious outbreaks have occurred mainly in districts adjacent to Perth, during the period August to mid-November.

Growers, especially those in these disease-liable areas, should keep a close watch at the time stated and apply protective sprays immediately Irish Blight is noticed, for in the absence of any spray treatment the crop may be completely ruined within a day or two.

The most obvious symptoms develop on the leaves in the form of blackish water-soaked areas which usually commence near the margins and rapidly work inwards (Fig. 1). Similar lesions may also develop on leaf stalks and stems.

The disease can be readily controlled by spraying with copper fungicides (Fig. 2). Either Bordeaux Mixture (copper sulphate, 4lb.; quicklime, 4lb.; or hydrated lime, 6lb.; water, 40gals); or Burgundy Mixture (copper sulphate, 4lb.; washing soda, 5lb.; water, 40gals.) are suitable.

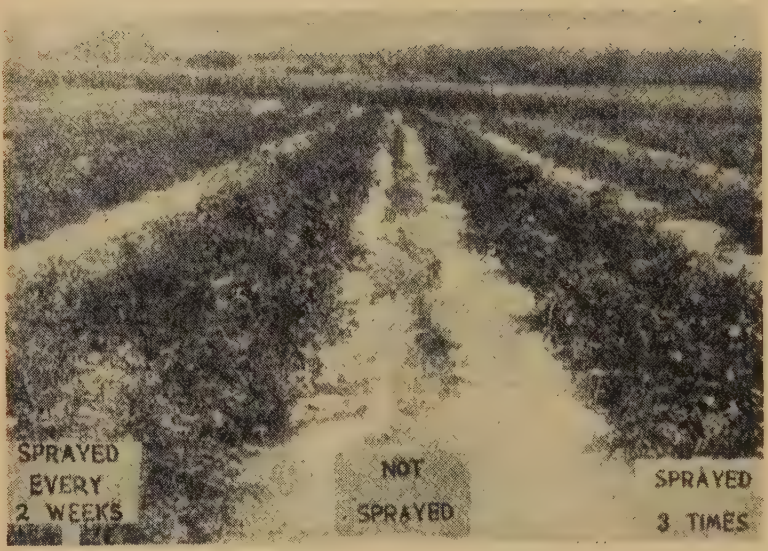

Fig. 2.—Showing effect of Bordeaux mixture in preventing attack by Irish Blight. Plants on left and right sprayed with Bordeaux mixture those in centre not sprayed.

The action of the spray is protective, not curative and hence the first application must be given immediately the disease appears in view of its capacity for rapid spread. Application should be repeated frequently, during weather conducive to its development, in order to keep the new growth covered with spray.

Leaflet No. 915 gives fuller information on this subject and is available free from this Department.

PEACH LEAF CURL

PEACH leaf curl caused by the fungus Taphrina deformans is a very common disease in this State during the spring and early summer. In addition to attacking both edible and flowering peaches, the fungus also attacks nectarines, almonds and apricots. When preventive measures are neglected the disease may be anticipated yearly commencing in spring.

Leaf Curl infection is most obvious on the leaves which become enlarged, thickened, blistered and greatly distorted. The whole of a leaf may be affected but generally only portions are attacked (Fig. 3).

The curled portions are at first green, then yellow, whitish, or yellow with a pink tinge and may become a deep red. A whitish bloom covers the surface. Finally, the affected leaves turn brown, die and fall. In this State no further infection usually occurs, new leaves are produced, and by Christmas the trees appear quite normal.

Shoot and fruit infection may also occur but is less common than leaf infection. Shoots become stunted, curved and more or less distorted when affected with disease, and the terminal bud generally dies. Fruit infection with us is noted more frequently on nectarines

than peaches and shows as red, irregular blistered areas which give the appearance of early ripening.

Control of Peach Leaf Curl.

Fortunately Leaf Curl is easily controlled. In fact it responds to treatment more readily than any other important disease of fruit trees. One spraying with lime-sulphur (1-10) or Bordeaux mixture (6-4-50) at any time during the dormant period is effective. When San Jose scale is present in the orchard, spraying with lime-sulphur (1-7) when the buds begin to swell is necessary. This will also control Leaf Curl without the use of a true dormant spray.

If for any reason preventive spraying is not carried out, and the leaves of peach, nectarine, almond or apricot trees actually become infected, little can be done, in this State, until the next season, with safety, as the foliage and fruits of "stone fruits" are very subject to injury by spray mixtures, except at very dilute concentrations, during the summer months. Usually, however, Leaf Curl disappears as the weather becomes hotter and drier towards Christmas and does not reappear till the following spring.

Fig. 3.—Peach leaves affected with Leaf Curl disease.

SHOT HOLE OF STONE FRUITS

"SHOT HOLE" of stone fruits caused by the fungus Clasterposporium carpophilum occurs yearly and is more difficult to control than Leaf Curl. It is often particularly damaging on early almonds, peaches, plums and apricots which come into growth in late winter or early spring while the weather is still cold and wet.

The diseases causes destruction of blossom buds, cankering of shoots, die-back and gumming of twigs, and warty, scabby, russetted or fissured areas on the fruits, which are often dwarfed and malformed. Invaded areas in the leaves often become brittle and fall away leaving the familiar leaf perforations from which the disease takes its name.

Under our conditions, early peaches are usually attacked most severely on leaves and shoots, whereas early apricots are mainly affected on buds, leaves and fruits.

Control of "Shot Hole" of Stone Fruits

For controlling "Shot Hole" the best treatment is to delay the dormant spraying until the first buds are just starting to move in the spring ("early pink bud" stage). Then spray very thoroughly with Bordeaux (6-4-50) to every 50 gallons of which has been added ½lb. of calcium caseinate as a spreader. This treatment is also effective for Leaf Curl. Later sprays with copper and sulphur fungicides are prone to cause damage in this State and should only be used at weak concentrations.

If a second spraying is required for "Shot Hole" in the spring, after the early pink bud stage, "lime-sulphur" one part to about 100 parts by volume of water, plus 1lb. calcium caseinate spray spreader to each 100 gallons, may be used for peaches, almonds or plums, after the fruit is set, provided the weather is still cool, or Bordeaux mixture 2-3-50 plus caseinate spreader as above, for apricots.

Apricots should never be sprayed with lime-sulphur when in leaf, nor should peaches, almonds or plums be sprayed with Bordeaux mixture after the "early pink bud" stage (except just before the dormant period), or considerable dropping of leaves and fruit may result.

Recently however, new fungicides have become available, which are said to be safe for cover-spraying of stone fruits, and experiments are being conducted to test them for the control of Shot Hole. Growers who are interested in this matter may obtain further particulars from the Department of Agriculture.

In addition to the spraying with 6-4-50 Bordeaux mixture plus spreader at the "early pink bud" stage already referred to, it is an advantage in controlling "Shot Hole" to spray each year just before the leaves normally fall away in the autumn, using Bordeaux mixture of the same strength, 6-4-50.

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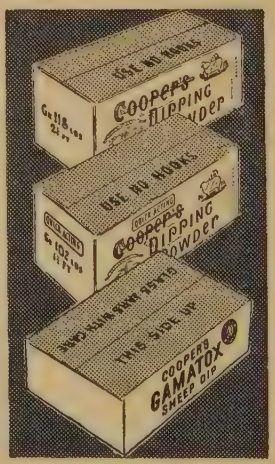

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INSECT Pests AND THEIR CONTROL

by C. F. H. JENKINS, M.A. *(Government Entomologist).*

THE RED-LEGGED EARTH MITE

(*Halotydaeus destructor* (Tucker))

THE red-legged earth mite is not a true insect, but is included in this series because the injury caused by the mite is very similar to that done by many insects and because the study of ticks and mites and their control is usually the work of an entomologist.

The original home of this mite is still doubtful. It has been known as a pest in South Africa since 1908, and in Western Australia since 1917. Bunbury was the first district to record the pest and it is believed to have been introduced per medium of vegetables and stores discarded from ships trading between the port of Bunbury and South Africa.

Red-legged earth mite—greatly magnified

Since its introduction the creature has spread practically throughout the South-West, and is a menace to pastures, flower gardens, and vegetables alike.

GENERAL DESCRIPTION

The name, red-legged earth mite, is really very apt, if somewhat lengthy, for it describes concisely the main characteristics of the mite. The tiny body is velvety black, and the legs, eight in number are red. The two front legs are somewhat longer than the others, and are used as feelers.

LIFE HISTORY

The eggs are laid only in suitably moist situations, and may be attached to the under surfaces of plants such as clover and capeweed. Under favourable conditions an egg hatches within a few days and a tiny larvae mite emerges. The young mite differs from the adult in its small size and the fact that, like an insect, it has only three pairs of legs. After moulting several times it gains the full complement of eight legs and becomes mature.

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It probably takes about a month or more, according to weather conditions, for each generation to develop and commence reproducing, so that there is ample time for several generations to arise during the winter months.

OVER-SUMMERING

It is only after cool weather and the winter rains have set in that the red-legged earth mite appears, and it soon ceases to be active when the weather becomes hot and dry. It passes the summer by means of resistant eggs which lie in the soil and successfully withstand the heat and desiccation. Many of these eggs are laid before the mite dies, but others remain in the dried body of the dead mite and hatch with the next winter rains.

HABITS

The red-legged earth mite is rather a delicate creature and is very susceptible to dryness, consequently it is only a pest during the winter months. It prefers moist, sheltered situations, and thrives especially where such weeds as capeweed are allowed to grow abundantly.

It is mainly on seedlings that the mite's attack is most serious. As soon as the tiny leaves appear the mites swarm upon them and cause them to bleach and wither. The mouth parts of the creature are adapted for rasping or lacerating the plant tissue, and the exuding sap is sucked up. Typical mite injury is indicated by the bleaching and whitening of the attacked foliage, but the absence of actual holes in the leaves distinguishes the injury from the bleaching caused by the lucerne flea, which also attacks pasture plants and many cultivated crops.

The mites are gregarious in habits, often feeding in clusters on a leaf or sheltering together in slight depressions in the ground. When disturbed they scatter in all directions, and if on a plant will usually fall directly to the ground.

The name earth mite is quite apt for the creature, as it seldom goes far from that element, and returns there as quickly as possible at the first sign of trouble.

It is on leguminous crops such as field peas and clover that the red-legged earth mite is most troublesome to the farmer although flax and linseed may suffer heavily and cereal crops are liable to attack. Under favourable growing conditions it is not usual for crops such as wheat and oats to sustain serious damage but when drought or other adverse factors retard plant growth the mite injury is accentuated.

CONTROL

Cultural Methods.—In order to minimise the depredations of this pest all weed growth, especially capeweed plants, should be reduced to a minimum. Where it is possible to plant field crops such as flax, field peas, etc., on clean fallowed land the damage from mites will be greatly reduced and infestation will mainly arise from weedy fence-lines and head-lands. Where fallow is not available for susceptible crops, weedy land should be turned in as long before planting time as possible so that mites already present in the area will be starved out before the new crop has germinated.

Burning may assist in reducing mite numbers where the grass fire is sufficiently hot to destroy eggs. A quick, patchy burn, however, may be relatively ineffective.

Chemical Methods.—Prior to the advent of DDT and the other "New Insecticides," chemical control for the red-legged earth mite was impracticable over large areas.

Various contact sprays such as Black Leaf 40 and phenyle solutions were available for market gardeners and backyard growers, but the effects of

such treatments were too short-lived to be of use to the grazier or farmer.

Of the better known "New Insecticides" DDT and BHC (Benzenehexachloride or Gammexane) have both proved toxic to the red-legged earth mite.

DDT has been found particularly promising on account of its long residual action and field treatments with this material have given very satisfactory control. Dusts applied with a power duster have given satisfactory protection to young pea and flax crops and are worthy of trial on any high value crop. In some instances the applications have not been made to the total crop but to strips of varying widths around the fence lines and around stone heaps and trees so as to prevent the migration of mites from such sites into the centre of the crop.

Some farmers have applied DDT dust through the drill, mixing it with superphosphate and allowing the hoses to hang freely outside the hose shoes so that the mixture is sprinkled freely on the surface of the drill row. The residual action of the DDT then gives protection to the young seedlings when they first emerge.

The adaptation of a small seeds attachment or a special feed system for applying DDT to the soil surface at planting time would appear worthy of further investigation.

Low volume spray units can be used instead of dusting machines and their popularity for weed control means that their use for other purposes may save the necessity of purchasing additional equipment.

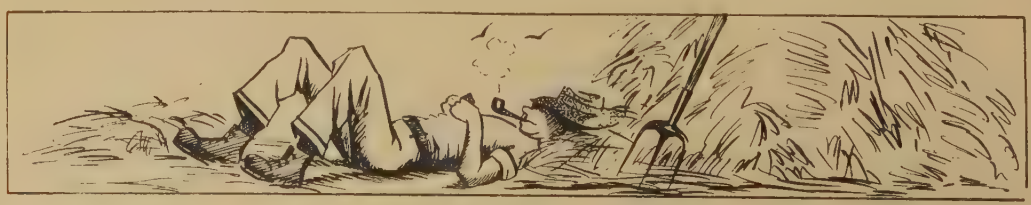
Rates of Application

DDT is recommended at the rate of ½ lb. to the acre. To obtain this rate 2% dust may be applied at the rate of 25 lb. per acre or liquid sprays in accordance with the output of the particular machine available.

In the case of a low volume outfit applying 10 gallons per acre, a proprietary 20% emulsion would require to be mixed at the rate of 1 gallon to 40 gallons of water. These proportions could be varied in accordance with the DDT concentration available or the required output of the spray unit. Aerial spraying is a comparatively recent innovation in this State and has still to be proved against the red-legged earth mite. In certain areas, however, where there may be difficulty in driving equipment over boggy paddocks after sowing has been carried out, aerial treatments may have special merits.

For market gardens and in backyards, 2% dust is quite satisfactory for treatings seedlings and the surrounding soil. Where sprays are favoured a 0.1% water mixture is recommended.

The red-legged earth mite problem is one which is being closely studied by C.S.I.R.O. entomologists in this State, particularly with a view to devising field treatments suitable for extensive areas of pasture. The fact that lucerne flea and red-legged earth mite are often associated together further complicates the problem for DDT is relatively ineffective against the lucerne flea and no single treatment sufficiently economical for general farm use has yet been devised. Some of the more recent insecticides have shown promise, however, and are being still further tested.



RAISING QUEEN BEES

Some Tested Methods

By R. S. COLEMAN, Government Apiculturist

MOST beekeepers are constantly seeking new and better methods of raising good queen bees and these suggestions, while capable of many refinements, will give good results for small-scale beekeepers when they wish to re-queen their hives. Most commercial apiarists have their own favourite methods incorporating variations of these ideas.

It is generally believed that a queen bee raised from the egg is superior to one raised from a grafted or transplanted two-day-old worker larva. Therefore, in this article I have described several methods of using eggs rather than those in which larvae are transplanted.

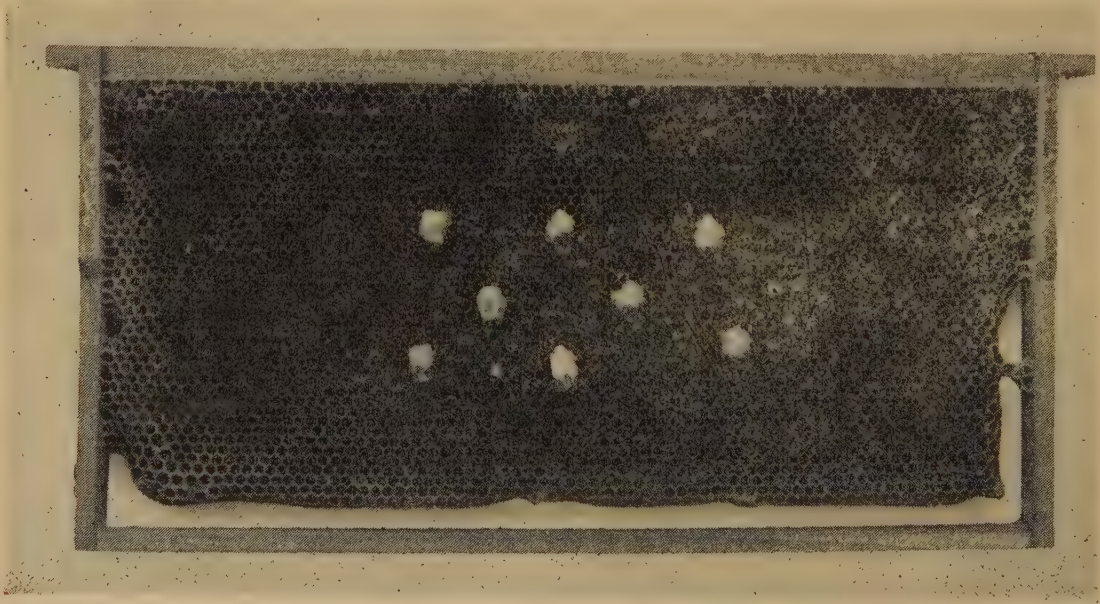
The most important factor which makes for good qualities in the future queen is adequate feeding during her larval life. For this reason, the hive used to rear queen bees should be strong in young bees to give the ample supplies of royal jelly necessary to healthy growth. The migratory beekeeper can usually arrange this by placing his apiary in a district rich in varied sources of pollen, and with a light stimulating flow of nectar. For the smaller or stationary beekeeper the best queen-raising period is the swarming season. Strong hives may be built up by combining two or three colonies by the paper method, or by shaking bees in front of the hive, from brood frames taken from other hives.

When a suitable strong colony has been built up, six or eight frames of emerging brood covered with bees should be placed in a super on top of the hive but separated from it by a fly-wire travelling screen. Make sure that the queen is not carried up above the screen, and give the bees in the queenless top super a flight hole, either by placing "risers" on three sides of the screen, or by boring an inch hole through the hive body.

Leave this super in place for four days, then check it over carefully for freshly-laid eggs which would indicate that the queen was accidentally included. At the same time break down

Cell punch (top); sticks used for pushing cells from the punch, and wire spirals used for attaching cells to comb.

any queen cells which are under construction. With this done your hive is ready to raise queen cells and to do this you should introduce eggs from the best queen in the apiary. Such a queen should be from a hive with the best record of honey production and she should have other good qualities to recommend her such as the uniform marking of progeny and a reputation



Cells attached to a comb.

for breeding long-lived workers, good clean housekeepers and good comb builders.

INTRODUCING THE EGGS

The simplest method of obtaining queen cells is to introduce into the queenless super a frame containing only eggs from the breeding queen.

This may be arranged by removing all the brood from the hive of the selected queen except the frame upon which the queen is working. The brood frames are replaced with dry, drawn combs, and it will be found that a good queen will soon fill a frame on which she is laying and will move on the adjoining empty frame which will then only contain eggs.

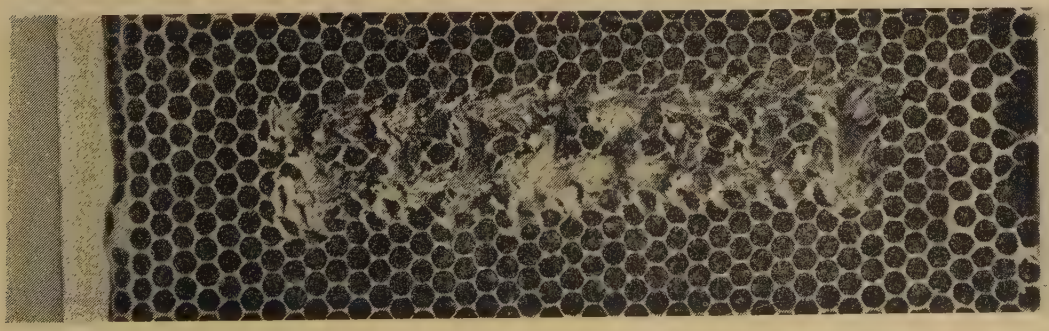
If this frame is transferred to our queen-raising super the bees will raise a number of queen cells from these eggs, the number depending upon the pollen supply, number and age of the bees and the amount of nectar available.

An alternative method of utilising the full frame of eggs is to empty the cell-raising super of all its frames with the exception of two frames of emerging brood on each side of the ten-frame box. Make up the numbers of bees, by shaking in as many frames of young bees as possible, then place the frame containing eggs laid by the selected queen face downward with the ends of the frame raised on the frames of brood. This method will give queen cells hanging at right angles to the frame where they may be more easily removed.

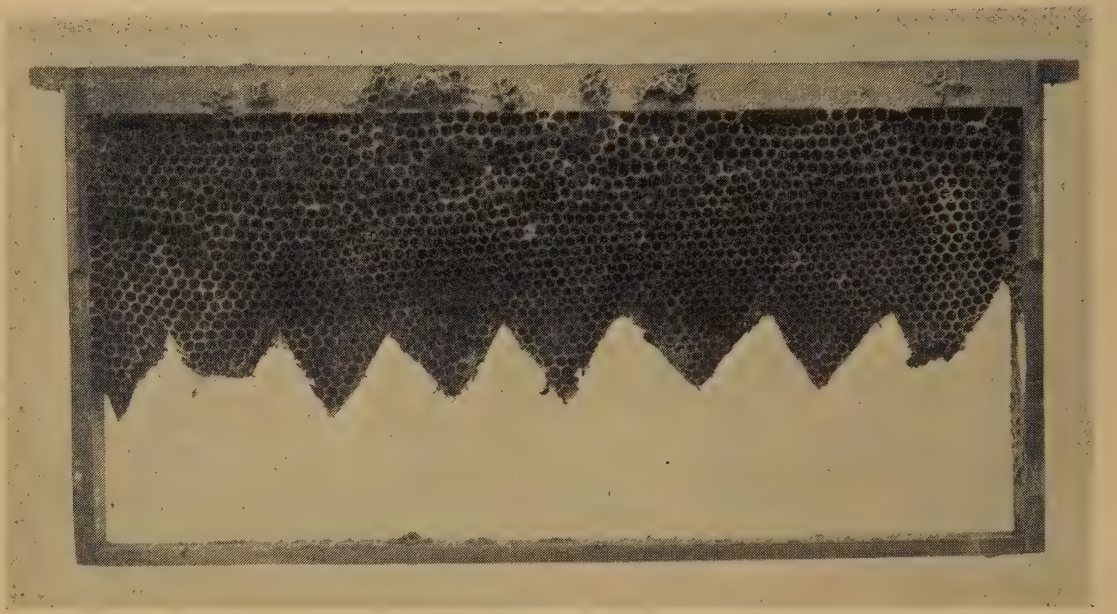
A refinement of this method is to kill two rows of eggs horizontally then miss one row, kill two more rows and so on. Next, working vertically, kill two rows, miss a row, kill two rows and continued throughout the frame thus leaving single eggs isolated from the other eggs by two rows of destroyed cells. The destruction of the eggs and cells is done by running a hot knife down and across the frame in such a way as to destroy the unwanted cells. This method gives cells which are very easily removed from the frame for transference to hives where re-queening is necessary.

Another method of introducing the frame containing eggs to the queen cell raising super is to cut away portion of the comb leaving the bottom of the frame portion in a saw-tooth pattern with the points about two inches apart. The bees tend to raise queen cells from the eggs near the points. The portion of comb removed from the frame may be attached to an empty frame and used in another queen cell raising hive.

Another method that has all the advantages of grafting plus the added advantage of raising queens from eggs is to cut out the worker cell with the egg in it and insert this in a wire spiral which can be pinned on to a brood frame to be raised and may then



Showing method of destroying two rows of cells vertically and horizontally to leave isolated cells for queen raising.



Comb cut in a saw-tooth pattern to facilitate the building of queen cells.

be removed easily when the cell has been capped, and transferred to the hive to be re-queened.

The cell containing the egg is removed from the comb by means of a hollow punch 7/16ths of an inch in internal diameter and about two inches long. This punch can be made by rolling up a piece of tin or sheet brass in the form of a tube. The edge is sharpened by filing down the outside of the tube so as not to reduce the inside dimensions.

Heat this tube by standing it in boiling water and then punch out the required cell with a quick rotary movement going right through the comb. With a tapered stick, too large to fully enter the cell, the cell may be pushed out of the punch and is then held with the stick and one end is fitted into a wire spiral and secured by dipping into hot wax. Only a quick dip which immerses a small portion of the cell is needed otherwise the egg may be endangered by overheating. When the cell is securely attached to the wire expand the top of the worker cell with the tapered stick until it approximates the diameter of an embryotic queen cell, and place it on a comb of brood in the queen cell raising super.

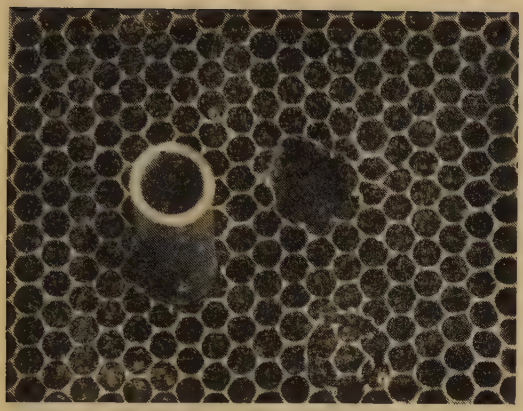
POINTS TO REMEMBER

1. Make the queen cell raising hive as strong as possible by shaking young bees into it, using brood combs from other hives. This can be done by shaking the bees into the super when it is placed above the fly wire screen.

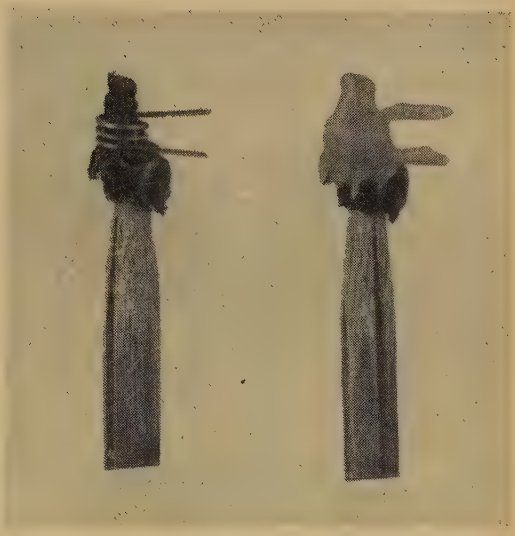
2. Check after four days to make sure that there is no queen and no queen cell in the super.

3. If there is the slightest doubt about the nectar flow, feed the bees with a sugar or honey solution so heavily that if the rate of flow was increased the bees could be swamped out. In other words feed your queen cell raising bees to their maximum capacity. In addition to this there must be a plentiful supply of pollen available.

4. Try to do the work on days when the temperature is above 75 degrees and less than 98 degrees. The ideal temperature is between 85 degrees and 90 degrees.



Punching cells from comb.



Left, cell removed from comb and fitted with wire spiral holder. Right, same cell after dipping in hot wax to secure wire.

5. It is almost useless to try to work with queen raising hives when severe robbing is taking place in the apiary, so at the slightest sign of robbing, stop work and wait until conditions are normal.

6. Do not expect many cells under the superseding method, as the idea is only to raise a few, but that few of high quality.

RE-QUEENING

After six or seven days the capped queen cells may be removed from the queen cell raising super and placed in the hives which require re-queening. Alternatively, they may be placed in a queenless hive which will care for them until they are ready to be introduced.

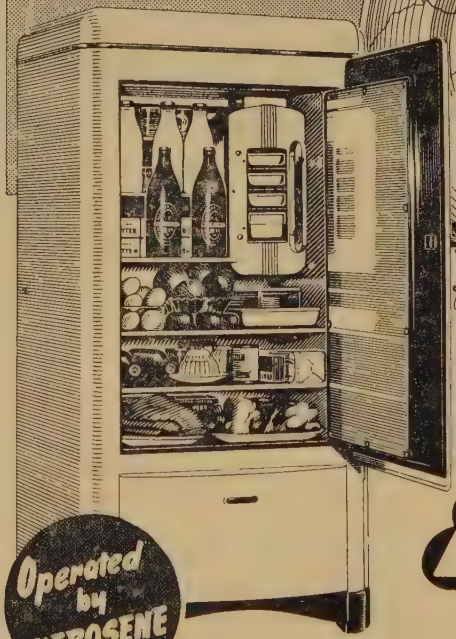
Where the wire spirals have been used it is a simple matter to remove the cells from the combs in the queen cell raising super and transfer them to brood combs in the hive to be re-queened. Where the spiral has not been used, the cell is removed from the super, a small frame nail is pushed through the upper wax of the cell and it is then attached by means of the nail to a hollowed-out portion in the brood frame of the hive which is ready for re-queening.

When introducing the cell to a hive, always place it in close contact with emerging brood otherwise the queen cell may be neglected. Commercial queen raisers always insist upon the importance of having a strong hive for the young emerging queen. This ensures that the young virgin is well fed and will result in the evolution of a better queen than if she is mated from a weak hive.

It is customary to remove or kill off the old queen about a week before the introduction and then to examine the hive two days before introducing the new queen cell to make sure that there is no queen and to break down any queen cells which may have been built in the meantime.

Many beekeepers do not take the trouble to remove the old queens but simply place two frames of brood in the top super with the queen cell between them. In nine cases out of ten, the young virgin queen on emerging will search for and destroy the old queen so that the labour entailed in searching for her may not be warranted.

It takes all types to make a world



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A row of the variety Signora P. Puricelli growing in the author's garden. These plants are two years old and average seven feet in height.

THE WINTER PRUNING OF ROSES

C. C. HILLARY

NEXT to picking armfuls of blooms, I doubt whether any phase of rose growing gives the gardener greater pleasure than pruning. To cut off a misplaced branch, or to relieve the plant of worn-out wood which has already produced its share of flowers; to snip away the spindly growths and twiggy bits which overcrowd the centre of the bush; to stand off and visualise just how lovely the plant will look when covered with flowers in three months' time, only to return again and cut off an inward-growing shoot which threatens to upset the symmetry of the bush; all this is work which can give keen pleasure to the enthusiast.

There is nothing difficult about pruning roses, and the work can, and should, be done by every grower of the Queen of Flowers. Those who always leave the work to others are never likely to acquire a proper knowledge of the art. Even if you do make a few mistakes at the outset, it will matter little; no rose bush was ever killed by pruning alone, and you will still have roses.

At the outset, however, I should like to correct the mistaken impression held by some that pruning makes roses grow. It does nothing of the kind. Food and water, and plenty of both are what makes roses grow. What pruning does do is to assist the plant to use its sap-flow to the best advantage, and by doing so enable it to produce a regular supply of good blooms throughout the season.

Hard, or severe pruning, as was customary in most rose-growing countries until a few years ago, is no longer practised. Experience with modern roses has shown that, except where the winters are particularly severe, moderate pruning only is necessary for the production

of good garden roses as well as exhibition blooms. Big bushes produce more and bigger flowers and big bushes should be the aim in every garden.

To obtain the best results from pruning, you must give your imagination full play and aim to build up the plants as you would have them when in full growth. Every time a branch is shortened, the eye should follow, in fancy, the progress of the shoot which will subsequently make its appearance. Only by adopting this practice will you become expert enough to build up a symmetrical plant which will be neither overcrowded with growth nor sparse with its blooms. Once the principles of pruning are understood, common sense is the quality most desired: the other requirements are a pair of sharp secateurs, a thin pruning saw, a sharp knife for paring the saw cuts, and a pair of stout leather gloves—if you value your hands.

TIME OF PRUNING

Pruning can be carried out at any time when the plants are dormant, but no advantage is gained by doing the work too early in the winter. Every district has its most suitable time, but even this will vary from year to year according to the kind of weather experienced in the autumn and early winter. Generally, however, the second half of July will be found the most suitable time for pruning in the suburbs of Perth. North of Perth a couple of weeks earlier would probably produce the desired results, while in the lower south-western areas it would be better to delay the work until the first week in August. Apart from fixing dates or times, however, the plants themselves indicate in no uncertain fashion when the work should be done. As soon as the lower, dormant buds commence to swell, it is a certain sign that the sap-flow is on the move again,

Fig. 1. PRUNING A TWO-YEAR-OLD ROSE-BUSH—This is a bush of the popular McGredy's Yellow, before and after pruning. Note that all the criss-crossing and spindly growth has been removed leaving only growths as thick as, or thicker than, a lead pencil.

Fig. 2. **PRUNING A ONE-YEAR-OLD BUSH**—A bush of Madame A. Meilland, perhaps better known as Peace. This bush carried an unopened bud which was left to flower. This stem (on right) will be cut back half-way to ground level as soon as the flower opens.

and the pruning should then be completed without further delay.

The reason why early pruning is unwise is that it stimulates the lower, dormant buds into action before the sap-flow is sufficient to nourish the shoots produced and carry them to maturity. The result is that after making a few inches of growth they languish and frequently die.

AN IMPORTANT POINT

The pruning of hybrid tea roses differs entirely from the pruning required by deciduous fruit trees. While a fruit tree, such as a peach or a plum, makes a permanent framework which usually lasts the life of the tree, the rose is continually renewing its framework by throwing up new shoots from the base of the plant. It is important that this difference should be understood, because it is on the different habit of growth that the system of pruning is based.

The new shoots sent up each year from the base of the rose are known as basal-shoots or water-shoots. As they grow, they tap and divert to themselves the sap which was nourishing the former main canes, thus causing the latter to lose vigour. The new shoots, after serving a useful life for a season or two, in turn also get "tapped" and starved by succeeding growths—a process which continues indefinitely throughout the life of the plant. This change takes place every year, and to prevent the bush from becoming cluttered up with useless branches, the impoverished and worn-out wood must be removed each year during the winter pruning.

Anyone can soon learn to tell the difference between impoverished leaders and healthy canes if they will spend a little time carefully observing the plants. The former usually have bark of a yellowish-green appearance with a surface which is rough and sometimes mottled. Healthy wood always has clean-looking bark of a clear green, or brownish-green colour.

It should be evident from the habit of growth outlined above, therefore, that the object of pruning is to gradually replace the worn-out wood, and to

regulate the flow of sap into a limited number of channels—sufficient to form a well-balanced plant capable of producing a reasonable supply of good blooms on strong stems. With regard to regulating the sap-flow, it must be remembered that at the base of every leaf on the stems of roses there is a bud or eye. Every bud is capable of forming a new shoot and, if all of them were allowed to develop, the sap would be diverted into so many channels that the resultant growths would be poor. By removing a number of eyes or buds at pruning time, the sap is forced to flow in greater quantity in the remaining wood and stronger shoots and better flowers result.

WORK IN STAGES

Those who are pruning bush roses for the first time will find that the work is more easily accomplished when done in definite stages. First, go over the plant and remove all the dead and worn-out wood. Thick canes and branches should be sawn off and the saw-cuts pared over with a sharp knife. Then remove all the twiggy bits, spindly pieces that are thinner than a lead pencil, and any growth which might cause damage by criss-crossing through the centre of the plant.

The bush will now have a more open appearance and the pruner can better gauge how much of the remaining wood

Fig. 3. **TREATMENT OF A WATER SHOOT**—The tall centre growth, indicated by the arrow, is a water-shoot on the variety Charles Gregory. On the right, it is shown after pruning. The top centre has been removed and the three laterals shortened back.

Fig. 4. CORRECT USE OF SECATEURS—At left a slanting cut is shown being made about a quarter of an inch above the bud or eye. At right the secateurs are held to show how the heel or hook (not the blade) presses against the part of the branch which is being removed.

should be removed. The next step is to shorten back all the upright-growing leaders, with the exception of the water-shoots produced during the recent summer and autumn. If the leaders are cut back to a plump bud pointing in the required direction, situated just above the highest, strongest-growing lateral or side shoot, the pruning will be hard enough.

Water-shoots should be removed only when they are badly placed on the plant. Those that are left should not be shortened below the topmost branch and, if no branch has formed, the top few inches only should be snipped away. In the second year, the water-shoots will have produced branches lower down. They are then regarded and treated as leaders, being shortened to a plump bud situated just above the highest, vigorous lateral or branch. A vigorous branch is one with wood thicker than a lead pencil.

The final stage is the shortening of the laterals or side branches which grow outwards from the leaders or upright canes. All of the laterals should be cut back to within one, two, three, or four buds of the point where they spring from the leaders, according to the strength of the shoot. Stout laterals may carry three or four buds or eyes: weak laterals never more than one. If there are so many laterals that they are likely to overcrowd the bush, a proportion should be removed entirely.

Use sharp tools when pruning your roses, make your cuts cleanly and do not leave any jagged ends or pieces. All cuts should be made in slanting fashion almost a quarter of an inch above a bud pointing in the required direction, and remember that a shoot always grows the way the bud is pointing. The heel of the secateurs should press against that part of the wood which is being removed and not against that which is left on the plant.

Do not be frightened to cut into your plants—you are not likely to harm them much, even if you do make mistakes. Timid people rarely make good pruners. But if in doubt as to whether a particular branch should be removed or not, leave it on: it can always be cut away later if thought desirable. Do not prune the weak growers severely as is sometimes recommended. If you do, there will be little of the plant left. Light pruning is the only pruning suitable for such varieties. In general, however, remember that no piece of wood any thinner than a lead pencil is of much use to a hybrid tea bush rose for any purpose.

When pruning has been completed, all prunings should be gathered up and placed in a heap ready for burning. The plants should then be sprayed with a suitable fungicide to protect them from disease. Mr. W. P. Cass Smith, Government Plant Pathologist, recommends the use of winter-strength lime sulphur in those gardens where mildew has been the principal disease. In gardens where the plants have suffered from both mildew and black spot, Bordeaux mixture should be used. Any scale on the plants can be eradicated with white spraying oil.

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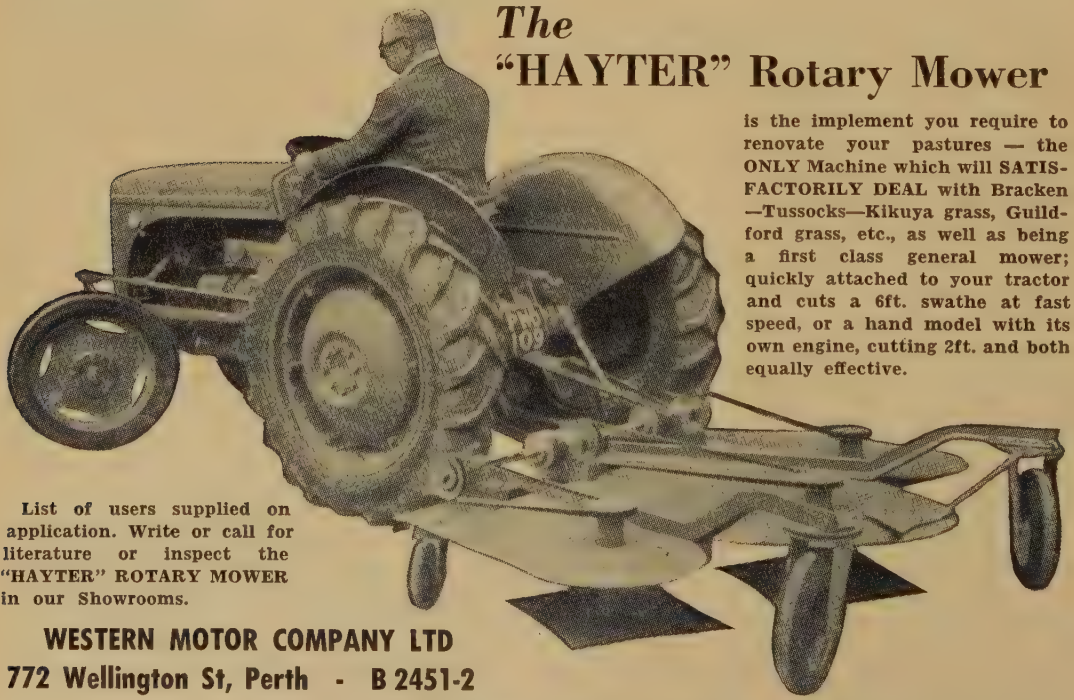

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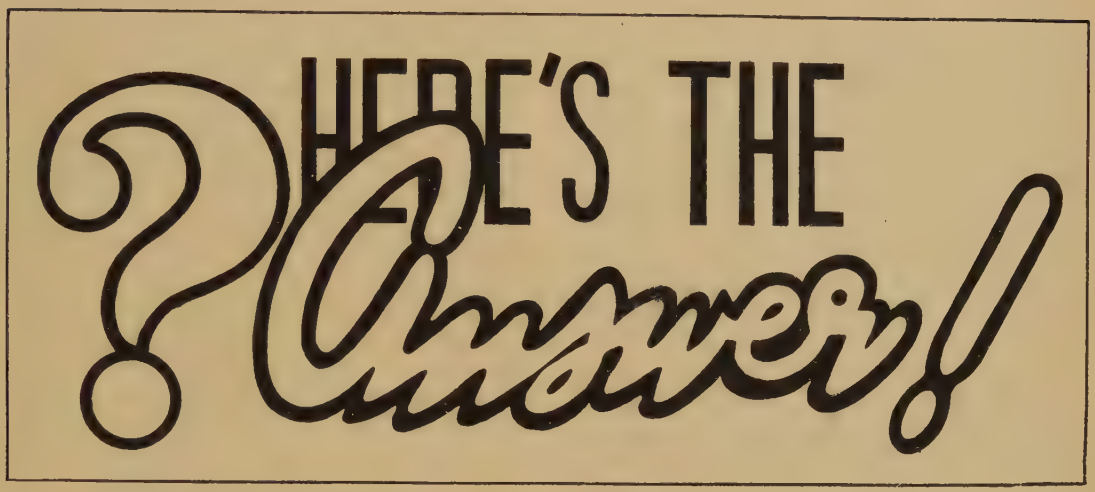


BULK SUPER STORAGE

We are thinking of storing superphosphate in bulk next year, and in order to assess the quantity of storage space likely to be needed we would appreciate some indication of the number of cubic feet required to house a ton of super.

A ton of bulk super occupies about 32 cubic feet, so a space 15ft. x 15ft. would accommodate about 21 tons in a layer three feet deep. A spokesman for the super-manufacturing firm which supplies this information said that he would not advise storing the fertiliser in greater depths than this. A three-foot layer could be forked over occasionally to prevent it from caking.

He also advised against bulking super on concrete floors which were seldom really dry. Wooden floors, or concrete floors covered with a layer of sleepers would be less likely to encourage caking from excess moisture.

SALT-AFFECTED SOILS

Would subsoiling be effective against patches of salt which have appeared on some of my paddocks? If so, at what distance apart should the deep furrows be ploughed, and would it be advisable to run them with the fall of the land or across it?

Subsoiling generally means the ploughing or breaking up of the soil to greater depths than normal working, so that under Western Australian wheatbelt conditions the breaking of the soil to a depth of 6in. to 9in. with suitable ripping points has been referred to as "subsoiling." Experiments carried out by the Department over the period 1946 to 1950 on the property of Mr. R. Whitehead, at Hines Hill, gave no evidence that subsoiling would improve the yields from salt-affected land as compared with yields which were obtained by cultivation of the soil to shallower depths of 2in. to 4in.

In your district you are probably concerned about patches of salt-affected land where there are seepages of brackish water or where the ground water level has risen over a period of years since the land was cleared for farming. In such cases some improvement of the growth on the area may be obtained by the ploughing of furrows approximately on the contour two to three yards apart. Into these furrows small amounts of surface soil are washed and the seeds of grasses and other plants lodge in the furrows and in the roughened soil and become established.

Some salt-affected areas adjacent to creeks and on slopes remain very wet throughout the summer through the

seepage of brackish water, and in such areas it is worthwhile to try the summer growing salt tolerant grass, *Paspalum vaginatum*. Rooted pieces of this grass are available from the Avondale Research Station at Beverley and it may be convenient for you to call there at some time to see the conditions under which it grows and to obtain a supply of rooted pieces which the manager of the station will allow you to have on request.

INSURING BEEHIVES

One of my neighbours lost all his beehives in a bushfire last summer and as I own 35 hives I wondered if it would be possible to insure them against loss by fire or against foul brood and other diseases which may make it necessary for hives to be destroyed.

We understand that most insurance companies will accept insurance against fire, but not disease. The matter of compensation for hives destroyed because of infection with American or European foul brood was taken up by the Beekeepers' Section of the Farmers' Union recently but as yet no scheme is in force to cover such losses.

CARNIOLIAN BEES

I have been keeping a few hives of bees in my orchard, partly to assist in pollinating my fruit trees and partly to supply honey for domestic use, but the bees are very savage and it is difficult to work near the hives. I have heard that the Carniolian bees are very docile and easy to handle and would appreciate it if you could give me particulars of where I could obtain bees of this strain.

Pure-bred Carniolian bees are bred at the Department of Agriculture's apiary at Rottnest Island where the strain has been kept pure by not allowing other bees to be introduced there. They are certainly very docile and are a pleasure to handle beside being good workers.

Unfortunately, the Department finds it difficult to keep up with orders and there is a fairly long waiting list. Orders are taken in rotation as received and payment must be made at the time of placing the order.

The prices for queens are 7s. 6d. untested, 12s. 6d. tested and £1 select tested. Small nucleus hives can also be obtained priced at £1 12s. 6d., plus freight (usually about 7s. 6d.). These are sent with a laying queen and three frames of brood and honey. There is also a spare frame and wedges to make a solid foundation for travelling, and the spare frame, wedges, and nucleus box itself must be returned to the Department after the bees have been transferred to their new hive.

Owing to the prevailing seasonal conditions it is not always possible to predict when the bees will be available but notification by telegram is made before the bees are dispatched.

In your own case it would be best to purchase queen bees and requeen your hives. The young bees will then be of the Carniolian strain and will soon replace the savage hybrids.

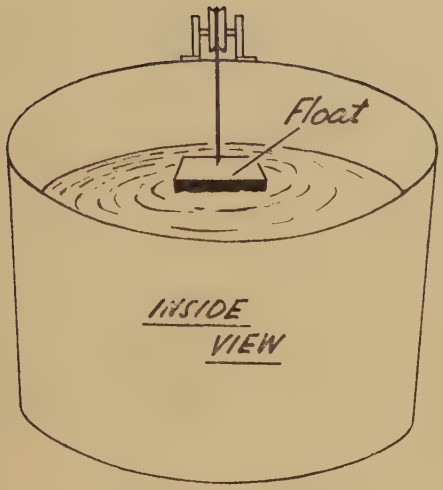
DDT AND TOBACCO

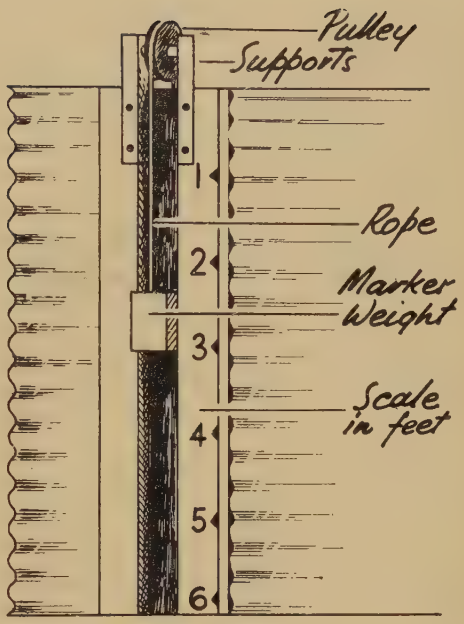
Is DDT recommended for use as an insecticide on tobacco?

For some years it has been erroneously thought by growers that DDT has a harmful effect on the quality of tobacco produced. Western Australian tobacco normally has a higher salt content than other tobacco grown in Australia, and the idea probably arose from the fact that the small amount of chloride in the DDT will add further to the natural chloride present.

The amount of chloride in DDT is very small, and when applied as a 2% dust or 0.2% spray, the build-up of chlorine on the leaf is very slight indeed. The usual method of applying pollard and arsenate dust will not control leaf miner, of which there is quite a large population in the district.

Therefore, the recommendation now is to use DDT either as a dust or spray, thus dispensing with other methods of dusting.





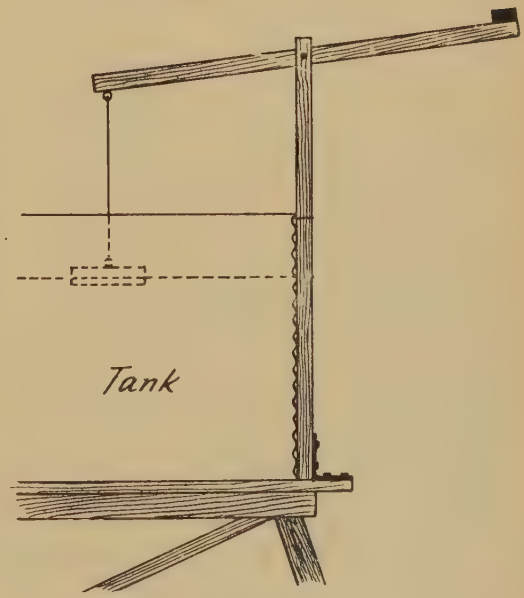
TANK GAUGES

We recently installed a hot water system which is fed from a 2,000 gallon tank placed on a high tank-stand. Can you recommend a simple gauge which would enable us to tell at a glance, the approximate quantity of water in the tank?

There are many different types of tank gauge, but most of them embody the same principles. There is usually a float in the tank and this is connected to an indicator outside the tank by means of a cord or wire running over a pulley.

The idea is shown in the larger sketch. The float may be a block of softwood, a metal canister soldered to keep it air and watertight, or even a tightly-corked bottle. The float should be slightly heavier than the sliding indicator on the outside of the tank and should be connected to the indicator by a length of cord or flexible wire rope passing over a pulley.

A scale painted on boards clamped to the outside of the tank indicates the depth of water at a glance. The groove in which the indicator slides should be painted in a contrasting colour—a white groove for a black indicator or a black groove if the indicator is painted white. The scale is in reverse—a high indicator denotes a low water-level and *vice* versa.



An even simpler method is that shown in the small sketch. An upright is bolted to the tank-stand and this carries a pivoted cross-bar to one end of which the float is attached. A counterweight may be attached to the other end of the cross-bar to give a suitable balance.

When the tank is full, the cross-bar should be horizontal. As the water-level drops, the float is lowered and the other end of the cross-bar rises. It is a simple matter to gauge the depth of the water in the tank by the angle of the cross-bar.

EMU DESTRUCTION

Is the emu listed as vermin and, if so, what are the best methods of destroying this pest? Mobs of emus do considerable damage to wheat crops in my district and although we try to keep them under control by shooting and running them down with dogs, we have not had much success.

Emus are proclaimed vermin in certain areas of the State but are protected under the Game Act in those Vermin Board areas wholly inside the No. 2 Rabbit Proof Fence and south of the East-West railway line.

However, the Chief Guardian of Game (Mr. A. J. Fraser) is always sympathetic toward applications for the lifting of the protection where it can be shown that emus or kangaroos are causing damage on farming properties within the protected areas.

Because of their roving habits, emus are difficult creatures to destroy, but some farmers have obtained good results with poisoned wheat. "Free feeding" is the secret of success and it is necessary to run out about a bushel of wheat in one or two places where the emus are most likely to find it.

Once the emus have taken the wheat, put down some more and continue until they have formed the habit of feeding in that spot, then put out the poisoned wheat in small heaps about six feet apart.

Ingredients:

20 lb. wheat.
4 lb. brown sugar.
1 oz. soluble strychnine.
1½ gal. water.

Method: Boil the water and add the strychnine and sugar. Stir well until dissolved then remove from fire, add wheat and allow to stand until the grain has soaked up all the moisture.

ARE YOU GETTING THE *MOST* FROM YOUR DAIRY HERD?

PENIJEC
For
MASTITIS
. . . SOLD BY CHEMISTS . . .

(OR IS MASTITIS REDUCING YOUR OUTPUT?)

YOU SHOULD KNOW THIS ABOUT PENIJEC AND MASTITIS

Penijec is made in TWO STRENGTHS because - broadly speaking **MASTITIS** occurs in **TWO FORMS.**

(1) Common (Streptococcal) Mastitis
(2) Stubborn (Staphylococcal) Mastitis

Diagnosis is difficult. Your animal may have both infections. To be sure, **HIT HARD** with a first dose of strong **PENIJEC (110).**

WE RECOMMEND:

First day – Penijec 110 followed by daily injections of Penijec 30 until quarter is normal. Animals with past history of **stubborn MASTITIS** – continued daily treatment with **PENIJEC 110** until quarter is normal. Best results are obtained when treatment is commenced without delay.

Be sure always to keep PENIJEC supplies on hand.

AUSTRALIA'S LARGEST SELLING MASTITIS TREATMENT

SEASONAL REMINDERS

TOBACCO NOTES

By T. G. HANEY, B.Sc. (Agric.), Officer-in-Charge, Tobacco Industry

NOW that the sales are over, growers should be ready to take good care of the tobacco seedlings for next season's crop. A good stand of healthy seedlings goes a long way towards an even crop, and is the first step towards better tobacco.

The application of benzol should commence at the beginning of September or when seedlings' leaves are about the size of threepenny pieces. Don't take chances with "blue mould." *Prevention is better than cure.* The recommended concentration is to have one-hundredth of the seedbeed area as evaporating surface for benzol. In an 18ft. x 3ft. seedbed, the total area is 7,776 square inches. Therefore the amount of evaporating surface for benzol required is 77.6 or 77¾ square inches. If the tins used are 3in. in diameter, 11 tins are required. Shallow tins are recommended, for economy in the use of benzol. It is not advisable to pour back into the drum any benzol remaining unevaporated in the morning, since the lighter fraction of the benzol always evaporates first, and if this is done, there is a tendency towards the end of a drum for an accumulation of the heavy fractions which do not evaporate so readily. Too much emphasis cannot be placed on keeping the beds as airtight as possible.

PEST CONTROL

The most common insect pests to invade the seedbeds are red-legged earth mite, slugs, cut-worms, seed-harvesting ants, and clover beetle. The mite and ants can be controlled by spraying with 0.02% solution of DDT emulsion. Dusting is not recommended in the beds because of possible injury to young seedlings caused by over application. Slugs can be controlled by the placement of metaldehyde baits, and cut-worms and clover beetles by placing bran-Paris green-molasses baits in appropriate places. It is recommended that seedlings be sprayed with 0.02% DDT spray immediately before pulling for transplanting, to give them protection against insect attack prior to the first poisoning in the field.

Seedlings should be "hardened off" before pulling for transplanting. Keep beds as dry as possible for several weeks before transplanting. This practice will force seedlings to develop a good, healthy root system and thus withstand the shock of transplanting.

TRANSPLANTING TO THE FIELD

It is best to pull seedlings in the early morning, and plant in the afternoon, when it is not too hot. Take care in planting, since replanting takes time and an uneven stand in the field produces tobacco of inferior quality, because of lack of competition between plants, and consequent lack of uniformity in harvesting, curing and grading. After each day's planting, the bran-Paris green-molasses bait should be laid around each plant to prevent loss from beetles, cutworms, and slugs. Make sure that no bait comes in contact with the plant. An alternative dust is made by mixing 2½lb. of 2% DDT dust with 24lb. pollard. This bait is applied dry. Where wireworms are causing misses in the crop, it is advisable to mix a handful of 0.25% Gammexane with the soil two days before replanting. If a paddock is known to be infested with wireworms, a preliminary treatment of 0.25% Gammexane dust applied at the rate of 50lb. an acre should give adequate control.

Every ten days after transplanting, it is recommended that the crop be dusted with 2% DDT dust. This will control all pests of tobacco such as leaf miner, budworm, and looper, and will also give some control against grasshoppers. Rate of application in a half-grown crop would be about 50lb. an acre. The first cultivation should commence about ten days after planting.

CHECK WATER SUPPLIES FOR BEES

BY OFFICERS OF THE APICULTURAL BRANCH

DURING the summer months, beekeepers should make sure that ample water is available to their bees at all times, not only to safeguard the health of the bees but to retain the goodwill of other primary producers, particularly the owners of the land upon which the bees are situated.

Never rely on the nectar alone to supply the water necessary for the hive. Nectar flows have a disconcerting habit of ceasing suddenly, leaving the bees without sufficient water.

If relying on natural water, make inquiries in the district to ensure that permanent supplies are available. It is risky to depend on supplies which may cut out during summer months leaving the bees waterless.

At all times it is advisable to place two or three 44-gallon drums, with the tops removed, around the apiary. Some sticks or palm leaves should be left standing in the water to allow bees to crawl out safely if they happen to fall in.

Before placing the bees on any site, make sure that it is effectively guarded against bushfires. An area of bare ground at least ten feet out from all the hives should be cleaned up immediately the hives are placed in position.

A BUSY PERIOD IN THE WHEATBELT

Fallowing, Haycutting and Shearing

BY OFFICERS OF THE WHEAT AND SHEEP BRANCH

SEPTEMBER and October activities will keep farmers busy in the wheat and sheep areas. Fallow will probably need attention and should be worked over if required. In these days farmers are less punctilious in working fallow as they have realised that over-cultivation is apt to encourage soil erosion, particularly on lighter soils.

Haycutting is an important seasonal task and it should be remembered that the cutting of cereal hay should be completed not later than two weeks after the crop has fully flowered.

Hay deteriorates when exposed to sun and rain, so should be carted as soon as it is sufficiently dry to stack. Where carting is likely to be delayed, make large stooks.

Meadow hay should be cut when the bulk of the pasture is in full flower and subterranean clover should be cut when just beginning to wilt. Delays in haymaking should be avoided, as exposure to the weather causes unnecessary chemical loss of the valuable and nutritious leafy portions of the plant and the green colouring matter which is particularly valuable as a source of vitamin A.

The modern trend towards mechanised haymaking equipment has cut down many of the losses formerly encountered. Power mowers, side delivery rakes and pick-up-balers enable hay to be baled direct from the windrows so that many of its valuable nutrients are retained.

September is the main shearing month and flockowners should study the various pamphlets on shearing and preparation of the clip which are available from this Department.

Large numbers of fat lambs will be marketed during the month so flockowners should book killing space at the export works and ensure that the lambs are handled carefully to avoid bruising.

With the shearing completed, weaners should be placed on good grazing and the ewe flock should be competently classed. Culls should be sent to market or placed on suitable feed for fattening, and ewes intended for mating should be placed on paddocks where they do not become overfat before mating. Very fat ewes are difficult to "flush" and may only register low lambing percentages.

Dipping to control lice and tick is compulsory and should be carried out three to six weeks after shearing, with an approved dipping preparation used according to directions. During October drench for the control of worms.

SPRINGTIME IN THE ORCHARDS

BY OFFICERS OF THE HORTICULTURAL BRANCH

COVER crops which are planted in the autumn will be in full flower during early September and at this stage the best results will be obtained if they are ploughed or disked in. If left too late the plants become tough and do not decompose as readily as when turned under while succulent.

Pruning of all deciduous fruit trees should now be finished, but it is possible that, through wet weather, labour shortage, etc., this work is behind schedule and, if so, every endeavour should be made to have the work completed and all prunings destroyed by burning before the buds break.

DISEASE AND PEST CONTROL

(a) Stone Fruits: At pinking stage of bud burst all varieties of stone fruits should be thoroughly sprayed with 6-4-40 Bordeaux mixture for the control of such diseases as shot-hole, peach leaf curl and rust. If a further spray is required, an application of lime-sulphur 1-100 can be applied. Apricots, however, should never be sprayed with lime-sulphur after petal fall or damage to fruit will result.

(b) Apples and Pears: Oil sprays as an ovicide for the eggs of bryobia mite and for the control of scale insects would have been applied in July-August, but where heavy infestations occur a further spray with lime-sulphur one gallon in 10 gallons of water is recommended just before the buds break.

For the control of pear scab use Bordeaux mixture 5-4-40 or Bordinette 1lb. to 10 gallons of water at spur-burst and if necessary follow up again at petal fall with half strength mixture.

For varieties such as Josephine and W. Cole which are very susceptible to spray russet a 3-5-40 Bordeaux mixture should be used. An alternative spray for these varieties is lime-sulphur 1-75.

The poor setting of apple and pear crops in the Great Southern areas last season was largely due to thrips in plague form. Damage from this pest can be considerably reduced by .1% D.D.T. spray applied while the buds are in the pink stage.

At petal fall it is advisable to spray apples with a combined spray mixture of white oil 1 gallon and 3 lb. of arsenate of lead powder to 50 gallons of water for the control of looper caterpillar, cutworm and San Jose scale.

(c) Citrus Fruits: The harvesting of the navel orange crop should now be finished. Do not neglect to strip the trees of fruits that were missed when picking as they are potential breeding places for fruit fly.

Spray at weekly intervals with—

1oz. sodium fluosilicate,
2½lb. sugar (white),
4 gallons of water,
or the proprietary mixture "Lurotox".

SPRAY PLANT

Make certain that the spray unit is left in readiness for the spring spray for looper caterpillars and spring beetles on apples and pears.

GRAFTING APPLES AND PEARS

As with other orchard practices the most suitable time for this work varies according to the district but generally

can be commenced as soon as the bark lifts freely where bark grafts are used. Cleft and whip-tongue grafts can be done any time during the dormant season.

Only dormant scions which were previously selected from disease free and proved consistent bearing trees should be used.

The most popular method used is the Strap Graft on account of its ability to callous over large wounds and eventually to form a perfect union.

THINNING.

Heavy crops of early stone fruits will require thinning towards the end of October. This operation is easily and quickly performed while the fruit is quite small. Thin out any misshapen and blemished fruits and leave only sufficient for the tree to bring to satisfactory maturity.

There is always a demand for well grown fruit of good quality.

The district Horticultural Instructor should be consulted in reference to any of your orchard problems.

SOIL CONSERVATION NOTES

BY OFFICERS OF THE SOIL CONSERVATION SERVICE

AT this time of year pastures and crops are beginning their period of most rapid growth. Moving about the farm and the district farmers have the opportunity to notice the progress and benefits of established pastures, particularly where subterranean clover is included. The importance of improved pastures in crop rotations for increasing productivity and to achieve soil conservation cannot be too often emphasised. Plans for establishing further areas of pastures in 1953 may well be considered now.

Looking around the farm at this time of year there may be noticed strips or patches of poorer growth among the cereal crops. Often these will prove to be areas from which surface soil has been removed by water or wind erosion. The loss in production is quite evident and it is worthwhile to consider whether soil erosion on the property requires serious attention.

Advisers of the Soil Conservation Service are available to help farmers with their erosion problems. So that work can be efficiently organised requests for visits should be sent as early as possible to the Soil Conservation Service, Department of Agriculture.

A REMINDER

HAVE you registered your orchard? One fruit tree or a single vine is an orchard for the purposes of the Plant Diseases Act and must be registered accordingly. The registration fee for less than one acre of trees or vines is 1s. Apply Department of Agriculture, Perth.

HYGIENIC ALL-METAL

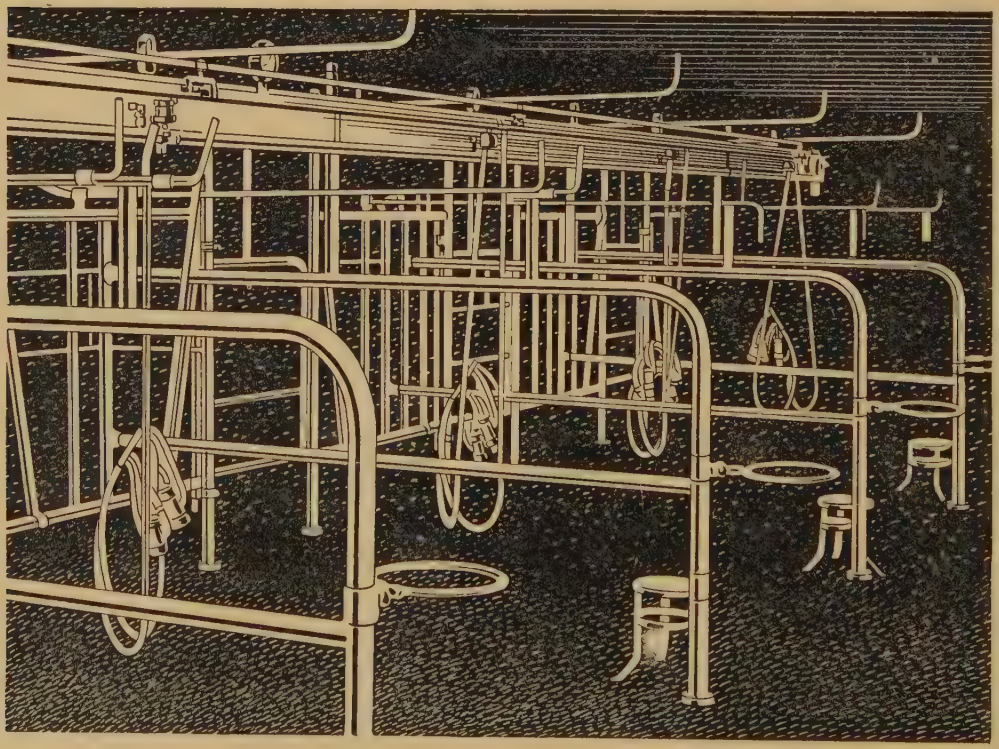
Milking Bails

The strong, simple construction of "Cyclone" all-metal Milking Bails ensures many years of hard service. Easy to clean and keep clean, these bails are the most hygenic available—so simple in operation that handling time is cut to a minimum.

Illustrated is the walk-through yoke type.

Contact "Cyclone" for further details and prices of other types.

All "Cyclone" designs conform with Dept. of Agriculture requirements.



by **Cyclone**

CYCLONE COMPANY OF AUSTRALIA LTD.

BROWN STREET - - - - - EAST PERTH

And at Melbourne - Sydney - Adelaide - Brisbane

WEST AUSTRALIAN GRASSES

MR. C. A. Gardner, Government Botanist of Western Australia, is the author of a recently-published 400-page work on the native and introduced grasses of this State. The book is the first part of a projected "Flora of Western Australia" which is expected to comprise at least six volumes.

In selecting the *Gramineae* as the subject of the first publication of the series, the author has been influenced by the importance of this family in the economic sphere. The grasses are the basis of our pastoral and agricultural prosperity as they include not only the vast number of indigenous and introduced pasture species but all our cereals and a number of summer fodder plants which have made valuable contributions to livestock husbandry.

Mr. Gardner's well-executed pen-and-ink drawings have long been a feature of his published works and are already familiar to many botanists and to readers of the West Australian Department of Agriculture's publications; recognition of the plants described in the book has been facilitated by the inclusion of 109 plates and illustrations from his portfolios.

Each genus has been illustrated, at least one species being depicted. Where the group is of importance, either by reason of its grazing value or as an important element in the flora, each species of the group has been shown.

Written for the botanist rather than the farmer, the book is essentially scientific in its treatment, but the inclusion of a comprehensive glossary of botanical terms and a number of explanatory diagrams will assist the layman in identifying plants.

The book contains reference to all recorded species of grasses in the State, both native and naturalised. Keys, both generic and specific are provided, and although they must of necessity be somewhat technical, a genuine attempt has been made to make them as simple as possible, without destroying their scientific value.

The systematic arrangement of the species is original in its conception and consistent in its execution. The whole of the grass family as represented in the Western Australian flora has been treated from first principles, the two sub-families being divided into sixteen tribes on characters which are different, at least in part, from those on which the conventional tribes are based. Nor has the author necessarily followed the accepted principles in the delineation of groups or sections within the genera,

but has sought out characters which, from his personal experience are known to be reliable and easily verified.

Perhaps the most important departure made by the author is the restriction of the limits of the tribe *Aveneae*. As usually defined by authors, this tribe contains genera in which, among other characters, the lemmas are awnless, or are awned from the back or sinus of the two-lobed tip. The tribe as defined in this book, contains only those genera in which the lemmas are provided with a usually twisted dorsal awn arising from the middle or below the middle of the organ. On this character of the awn, the tribe in Western Australia consists of only five genera. Of the other genera which are usually included, *Astrebla* has been transferred to the *Chlorideae*, whilst *Danthonia, Schismus, Eriachne, Pentaschistis, Koeleria, Trisetum* and *Avellinia* have been added to the large tribe *Festuceae* with which they have a greater affinity than they have with those genera which have been retained in the *Aveneae*. This arrangement serves also to bring together such genera as *Triodia, Plectrachne, Danthonia* and *Eriachne* which have many features in common and are closely related.

The author has not maintained the tribes *Eragrosteae* and *Leptureae* of Hubbard. The genera of the *Eragrosteae* have been divided between the *Chlorideae* and the *Festuceae*, while the *Leptureae* has been incuuded in the *Hordeae*, together with the closely related genus *Lolium*. This redistribution of the genera makes the tribe *Festuceae* a fairly large one, but no major difficulties have arisen in the construction of the keys to the genera, and the whole appears to be a uniform and closely related group.

In choosing key characters, emphasis has always ben placed on those which the author's experience has shown to be reliable. This is particularly noticeable in the genus *Stipa*, a group which offers many difficulties due partly to the fact that the character often used in subdivision is the nature, and the degree of twisting of the awn. It can be shown that the awn varies considerably during the process of drying, so that a key based on herbarium specimens is liable to give faulty results if applied to living plants. The ligule of the leaf and the vestiture of the awn, are constant for each species, and have been employed in the key, together with the nature of the lemma and palea.

A welcome feature of this volume, and one that is very infrequently seen in modern works on systematic botany, is the inclusion of the derivation of the generic names. The origin of some of the names is most obscure, and a great deal of research was necessary for the compilation of such a complete list. It is interesting to note that, as a result of this work, several derivations given here do not agree with those published in other works.

In addition, the reference to the original description is given for every indigenous species. Naturalised species are not described as fully as the native plants, while no reference is given to the original description.

Although designed especially as a taxonomic handbook, the volume contains much information of value to workers in other fields. For example, chromosome numbers are recorded for all those species which have been examined, but these are, unfortunately, wholly introduced grasses of economic importance. The very scarcity of information regarding the native species will, it is to be hoped, foster cytological interest in the Western Australian native flora.

Mr. Gardner has written much on plant distribution within the State of Western Australia, and it is fitting that in a book of this nature, the introduction should take the form of a general survey of the grass flora of the State. He is well acquainted with large areas of all three of the Provinces of the Western Australian flora, and much is to be

learned from the article, short though it is. From the tropical North where grasses are the main ground flora of all formations, to the South-West where they are poorly represented all phases of climatic and edaphic influences on grass distribution and development are fully dealt with, making the introduction a most valuable part of the book.

—R.D.R.

[*"Flora of Western Australia—Gramineae," by C. A. Gardner. Published by the Government Printer, Perth—Retail price, 45s.*]

SHEEPFARMING ANNUAL

ALTHOUGH dealing primarily with conditions in New Zealand, the 1951 Sheepfarming Annual published by the Massey Agricultural College contains much that will be of interest to Australian sheepmen.

The Superintendent of the Ruakura Animal Research Station (Dr. C. P. McMeekan) recently visited Uruguay as a member of the Food and Agricultural Organisation of U.N.O., and his article on sheep and cattle farming in that country makes interesting reading.

The use of aircraft for spraying and dusting has already attracted attention in Western Australia, but New Zealand, with large areas of difficult hill country, has gone farther and used aircraft for large-scale topdressing with superphosphate.

P. B. Lynch, an officer of the N.Z. Department of Agriculture, discusses the means used to drop 45,000 tons of phosphatic fertiliser on to about 450,000 acres of farm lands in 1950. Other writers describe methods of reducing costs of aerial topdressing, also the spraying of weed-infested country and the dropping of rabbit poison from the air.

Cheviot sheep, although practically unknown in Western Australia, play an important part in hill-country sheepfarming in New Zealand and several articles are devoted to the results of trials of Cheviot half-breds and Romneys.

There is an interesting article on "Sheep and Wool Improvement in the U.S.A." describing some of the new American breeds such as the Columbia, Targhee and North Star and the lesser-known Panama and Romeldale breeds. These are mainly based on Rambouillet strain with infusions of Lincoln, Romney, Oxford and Corriedale blood, followed by inbreeding to fix the type.

The articles printed in the Sheepfarming Annual are the scripts of addresses given at the annual meeting of sheepfarmers, organised by the Massey College and they are followed by questions and discussions following each talk, a feature which helps to bring out many points of general interest.

Talks on the growth of the fleece, on the design and construction of sheepyards and on copper and mineral deficiencies are among other interesting sections.

The book is obtainable from the Massey Agricultural College, Palmerston North, New Zealand, and the price is 15s. in New Zealand currency.

DAIRYFARMING ANNUAL

ANOTHER valuable service to the dairying industry has been given by Massey Agricultural College, New Zealand, in its publication of the "Dairyfarming Annual," the 1951 issue of which is now available at 15s. This 180-page record of the addresses and discussions at the College's annual meeting of dairyfarmers at Palmerston North last June covers a wide field of modern practical farming, many of the improvements in which have been due to the results of research and the experiences of dairyfarmers themselves. In this respect the book, well printed and adequately illustrated, is up to the minute, as it were, in such timely practices as spray irrigation, use of hormones on control of weeds, rationed grazing

(which the College itself was instrumental in introducing) and testing and servicing of milking machines.

The College, assisted by a committee of agricultural specialists and successful dairyfarmers, has not only chosen its subjects well, but has called upon some of the best-known authorities in New Zealand to prepare the papers. The Annual opens with nine articles on aspects of pasture improvement, ranging from pasture establishment, and nitrogen in pasture production, to such practices as spray irrigation, weed control with hormones, and rationed grazing, which has been shown to be an improver of pastures as well as of the annual milk and butterfat returns. This practice of using the versatile electric fence is dealt with under four headings, by Professor W. Riddet (Massey College), two successful dairyfarmers, and the New Zealand Dairy Board's consulting officer for Taranaki.

Much information of interest to the farmer is contained in a lengthy article by Dr. M. M. Burns, director of the New Zealand Fertilizer Manufacturers' Research Association, on the phosphatic fertilizer position in relation to the dairyfarmer. The rival claims of production per cow and production per acre cause a debate between A. H. Ward, Supervisor of Herd Improvement, New Zealand Dairy Board, and Dr. W. M. Hamilton, Assistant Secretary, Agriculture and Biology, D.S.I.R. The animal itself is treated in three articles—"Research in Animal Breeding" (Dr. J. F. Filmer, Director, Animal Research Division, Department of Agriculture), "Trichomoniasis" (D. McFarlane, Chief Diagnostic Officer, Wallaceville), and "Calf-rearing" (Professor I. L. Campbell, Massey College). The milking shed and its output come into the picture under the headings of "Testing and Servicing of Milking Machines" and "The Work of the Dairy Research Institute." The final article, on expansion of British agriculture (D. S. Hendrie, Agricultural Adviser to the U.K. High Commissioner), strikes this comforting note for New Zealand: "It is a happy thought that New Zealand's main export products (butter, meat and wool) do not embarrass British agricultural economy, but, in fact, fit in well with it even if the expansion programme there is fully achieved."

The discussions following the papers are in many respects as interesting as the main addresses. Many points covering everyday experience on the farm emerge from these exchange and from the Open Forum session.

PET RABBITS

A NUMBER of inquiries have recently been received by the Department of Agriculture concerning the legality of keeping rabbits as pets.

The Chief Vermin Control Officer (Mr. A. R. Tomlinson) states that anyone keeping or purchasing rabbits as pets should note that the Vermin Act provides a heavy penalty for the keeping of live rabbits unless a permit has been obtained. This applies to all types of rabbits.

The permits allow domestic breeds of rabbits to be kept as pets conditional upon them being confined in hutches within rabbit proof enclosures. They must not be permitted to roam loose on a property.

Permits may be obtained from the Chief Vermin Control Officer, at the Adelaide Terrace Branch of the Department of Agriculture, Perth. Full name and address should be given with each application together with a description and details of the hutch and enclosures.

A USEFUL GIFT IN CROCHET

By HELEN M. GLOSTER

WITH the first half of the year gone by, the question of Christmas gifts is already exercising the minds of many housewives. These little umbrellas are both useful and attractive and their making provides interesting employment for leisure moments.

Made from scraps of knitting wool the umbrella is filled with mothballs and hung in the wardrobe to act as a deterrent against moths and silverfish.

MATERIALS REQUIRED

Scraps of left-over 2-ply knitting wools in two contrasting colours. (The model shown in the photographs was made in cream and crimson.)

The completed umbrella and the materials used in its making—2-ply wool, in two colours; wire; moth-balls; ribbon and crochet hook.

1 Aero crochet hook (No. 12).

12-inch length of fencing wire bent to form the handle.

¾-yard of half-inch ribbon to match the contrasting colour of the wool.

A scrap of cotton wool.

A dozen mothballs.

METHOD

First Round: Using the contrasting wool (crimson) make six chain, join to form a ring.

Second Round: Make two chain, then five treble crochet into the ring. With the two chain stitches, this makes six upright stitches. Close the ring with a single crochet.

Third Round: Like the second row. The cover for the spike of the umbrella is now completed.

Fourth Round: Make two chain, then three treble crochet into space between two treble. Put four treble crochet into each of remaining five spaces. Close the ring. You should now have six groups of stitches, with four trebles in each group.

SAFE against shock, leakage, fire-risk

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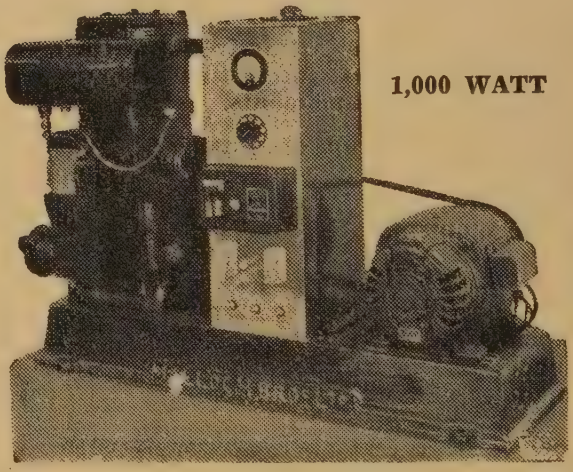
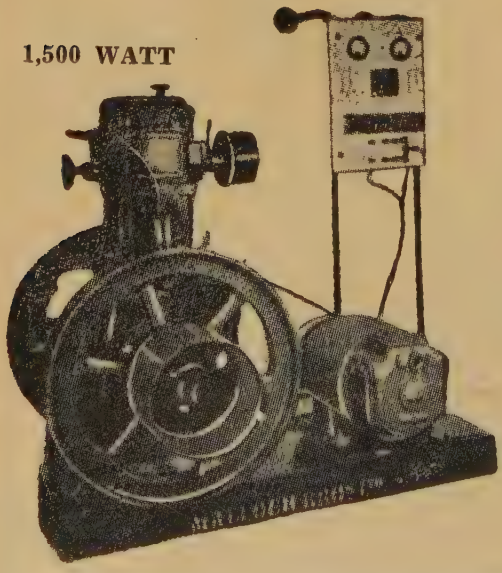


1,000 WATT



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Fifth Round: Two chain. One treble crochet into each space between treble stitches, with four treble crochet at each of the six corners. You should have four treble at each corner with three trebles between.

Sixth Round: Change the wool to main colour. Four treble crochet at each corner with six treble crochet between. Continue in the main colour until 12 rows have been completed. (Twenty-four treble crochet with four at each corner.)

Thirteenth Round: In contrasting colour.

Fourteenth Round: In main colour. Secure the wool.

The crochet portion of the umbrella completed.

TO MAKE UP

1. Cover eight inches (including bent end) of wire with ribbon.
2. Pad the spike with cotton wool, then slip on the umbrella cover. Fasten umbrella securely to spike with a few firm stitches.
3. Fasten the six peaks of cover to handle.
4. Make a ribbon bow and sew to handle.
5. Place mothballs inside each fold.

NEW METHODS WITH MINCE

By HELEN M. GLOSTER

COLD mutton is uninspiring fare at any time, but there are many tasty ways of using up cold meat. Here are a few ideas on utilising minced cooked meat without a lot of additional cooking. Most of them can be adapted for uncooked mince too by allowing a longer cooking period—and of course one could use minced beef, rabbit or poultry in lieu of mutton.

STEAMED MINCE MOULD

Ingredients.

1½ lb. cold mashed potatoes.
1 lb. cooked meat (minced).
1 dessertspoonful plain flour.
1 onion (minced or chopped).
1 tablespoonful chopped parsley.
A little grated lemon rind (optional).
Salt and pepper.
Stock or gravy to moisten.

Method.

1. Put on a saucepan or steamer of water to boil.
2. Take two-thirds of the mashed potato and line a greased pudding basin with a layer of mashed potato.
3. Mix the minced meat, onion, flavourings and flour together.
4. Add stock or gravy to the mixture and fill the basin to within one inch of the top with the mixture.
5. Place the remainder of the mashed potato on top.

6. Cover with greased paper and steam until thoroughly heated about half to three-quarters of an hour.

Serve with vegetables and gravy or tomato puree.

To Vary the Above.—Half a teaspoonful of mixed herbs will alter the flavour of the mince or you can add a sprinkle of ground mace with a little grated lemon rind.

For something different, try this curry flavoured mould:—

CURRIED MEAT MOULD

Ingredients.

2 cups cold cooked rice.
1 lb. cooked meat (minced).
1 onion.
1 tablespoonful sultanas.
1 dessertspoonful plum jam.
1 dessertspoonful curry powder.
1 dessertspoonful plain flour.
Grated lemon rind or a squeeze of juice.
1 dessertspoonful chopped parsley.
Stock or water to moisten.
1 tablespoonful chutney.
1 tablespoonful fat.

Method.

1. Put on steamer or saucepan of water to boil.
2. Fry the sliced onion and sultanas then turn on to a plate.
3. Cook curry powder and flour in fat until nicely browned.
4. Line a greased pudding basin with about two-thirds of the cooked rice.
5. Mix all the curry ingredients together with minced meat and stock and fill basin to within an inch of top.
6. Place over this the remainder of the cooked rice.
7. Cover with greased paper and heat thoroughly by steaming. In these recipes more hot stock or liquid may be added after heating or a gravy may be served separately.

N.B.—If uncooked meat is used, longer time must be allowed to cook thoroughly.

STUFFED VEGETABLE MARROW

Ingredients.

1 small vegetable marrow.
3 or 4 tablespoonfuls cooked meat minced.
3 tablespoonfuls soft breadcrumbs.
A little grated lemon rind.
1 teaspoonful chopped parsley.
Salt, pepper.
A little beaten egg or gravy for mixing.

Method.

1. Wash and dry the marrow.
2. Cut a wedge from the top side of the marrow and scoop out seeds and soft pulp.
3. Prepare the stuffing and mix with gravy or a little beaten egg.
4. Stuff the marrow and replace the wedge.
5. Place marrow in a piedish or baking dish with some dripping and a greased paper on top.
6. Cover with another dish or tin and bake in a moderate oven until tender.
7. Remove skin (it will come away quite easily).
8. Serve with mashed or jacket potatoes and a good white sauce.

N.B.—The quantity of meat may be varied according to the size of the marrow.

Variations.—Stuffed marrow may be steamed instead of baked. Flavourings in stuffing may be varied according to individual tastes. Worcester or tomato sauce may be used for mixing the stuffing instead of beaten egg. Nutmeg or mace may be used instead of herbs for flavouring.

JACKET POTATOES

If you have not already tried these, cook the potatoes this way; they are to be recommended. They add variety, look very attractive and last but not least the maximum quantity of Vitamin C and other nutrients is retained by this method of cooking.

Method.

1. Select medium well-shaped potatoes which will go floury when cooked.
2. Scrub and dry potatoes.
3. Prick skin, to prevent bursting.
4. Rub over each potato with melted fat or a butter paper.
5. Dry bake in the oven until soft—about 1 to 1½ hours. Potatoes may be tested by holding in a cloth and squeezing to see if they are soft. When potatoes are cooked, cut a cross through the skin along the top of each potato.
6. Squeeze the potato at the sides between the cross cuts and the cooked potato will loosen and become floury. Sprinkle with salt and pepper. Place a knob of butter on top of each potato. Garnish with chopped parsley or mint or a sprig of parsley or mint.

A PLASTIC SPONGE-BAG

THIS sponge-bag made from plastic cloth cost only eightpence for materials and took 20 minutes to make. Such bags would make useful and attractive gifts besides providing profitable spare time employment.

The main material used is transparent plastic cloth (alkathene) which is now obtainable in tubular form so that no side seams are necessary. The bag shown required one-third of a yard of this material priced at 1s. 6d. yard.

In addition you will require 1¼ yards of narrow braid or cord for the drawstrings.

TO MAKE UP

Machine along the base to form the bag. Make a 1-inch hem along the top, leaving an opening on each side through which the drawstrings may be inserted. A second row of sitiches ¼-inch from the top makes a better finish.

Run two lengths of braid or cord through the hem and join the ends neatly, and your bag is ready for use.

MUTTON AND LAMB

Some Suggestions for "Ringing the Changes"

By HELEN M. GLOSTER

WHETHER wool prices are soaring or slumping, most farm housewives must rely on mutton and lamb for the bulk of their meat supplies. A mutton diet can become monotonous when confined to a few standard dishes so if you are on the look-out for new ways of serving the meat, you may care to give these receipes a trial.

CUTLETS WITH BACON

Ingredients.

6 lamb cutlets or chops.

12 small pieces of bacon (cut from rashers).

1 shallot or white onion.

Grated lemon rind.

Pepper.

1 dessertspoonful chopped parsley.

A little butter or margarine.

Method.

1. Grease a piece of kitchen paper for each chop. The papers saved from purchased butter will do.
2. Place a piece of bacon in centre of each paper, sprinkle with chopped parsley, chopped shallot, grated lemon rind and a dash of pepper.
3. Place chop on top, then cover with flavourings and lastly the second piece of bacon.
4. Wrap each cutlet in paper and place in a baking dish.
5. Bake in a moderate oven about half an hour.
6. Remove papers at the last moment and serve with mashed potatoes and other vegetables.

N.B.—The liquor retained in the paper should be poured over the chops.

SPRING STEW

Ingredients.

2 lb. neck of lamb or neck chops.

½ lb. young carrots.

¼ lb. turnips.

6 shallots or 1 onion.

1 lb. *new* potatoes.

1 cupful green peas.

Few lettuce or cabbage leaves.

1 tablespoonful flour.

2 teaspoonfuls salt.

Pepper to taste.

Water.

Method.

1. Wipe the meat, trim neatly and cut into chops. Remove as much of the fat as possible.
2. Dip in seasoned flour, then place in a casserole and cover with water.
3. Bring to the boil and skim well.

4. Prepare the vegetables as follows:—

   Lettuce or cabbage broken into small pieces.

   Turnips and carrots in rings.
   Onion shredded.

5. Add all vegetables except potatoes and peas, stir in and cook for half an hour.
6. Add potatoes and peas and cook a further half hour or until potatoes are cooked.

Serve with meat in the centre and vegetables and gravy around. Garnish with sprigs of parsley.

N.B.—If mutton is used, cooking time must be lengthened. To be really tasty young tender spring vegetables should be used. If older vegetables are used, allow longer cooking time.

STUFFED LOIN OF LAMB

Ingredients.

A loin of lamb.
4 tablespoonfuls soft breadcrumbs.
1 tablespoonful chopped suet.
½ teaspoonful mixed herbs.
1 teaspoonful chopped parsley.
A little grated lemon rind.
1 egg.
½ teaspoonful salt and a little pepper.
Grate of nutmeg.

Method.

1. Bone the loin of lamb.
2. Prepare stuffing, stuff the loin of lamb, roll the meat around the stuffing and tie firmly with string.
3. Bake in the oven according to weight of meat.
4. Serve with baked potatoes, vegetables and brown gravy.

A shoulder may be boned and stuffed in a similar manner. The shoulder should be secured with skewers after stuffing is completed.

N.B.—Bones removed from the loin or shoulder should be used in the stockpot.

ROYAL SHOW

Entries Close - - - - - 1952

IN SECTIONS AS FOLLOWS:—

Arts and Crafts Thurs. 11th Sept.
Bread . Thurs. 11th Sept.
Cattle . . . Mon. 1st Sept.
Crop Competition Fri. 12th Sept.
Dogs . . . Thurs. 11th Sept.
Export Butter Sat. 28th June
Goats . . . Mon. 1st Sept.
Home Industries Thurs. 11th Sept.
Horses in Action Thurs. 11th Sept.
Horses, Breeding Classes Mon. 1st Sept.
Horticulture 2 p.m., Sat. 4th Oct.
Pigeons . Thurs. 11th Sept.
Pigs . . . Mon. 8th Sept.
Poultry . Thurs. 11th Sept.
Sheep . . . Mon. 8th Sept.
Wine . . . Thurs. 11th Sept.

OCT. 6th-10th 1952

Night Shows, Tues., Wed. & Thurs.

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WHEAT CROP COMPETITIONS

W.A. Flour Millowners' Assn. Series 1951/52

By I. THOMAS, Superintendent of Wheat Farming
and
H. G. CARISS, B.Sc. (Agric.), Agricultural Adviser

THE last issue of the Journal gave a review of the results of the 50-acre wheat crop competitions sponsored by the W.A. Flour Millowners' Association in 1948/49, 1949/50 and 1950/51, together with the championship awards for 1951/52. In this issue are set out the results for the individual zones in the 1951/52 competition, together with the judges' reports and details of each competitor's cultural operations.

ZONE 1

In Zone 1, Messrs. N. F. Hyde and Sons were successful in gaining first prize for the zone and third place in the Championship with a crop of Wongoondy calculated to yield 39 bushels per acre. This crop was sown during the third week in May, 60lb. of seed and 112lb. of super per acre being used. The paddock was originally timbered with Salmon gum and Gimlet. It was ploughed with a disk plough in June, 1950, under good conditions to a depth of 3in. and cultivated back in August. The crop was very even and stood well although some shedding had occurred. It was free from disease and admixture.

The second prize was won by a crop of Mr. H. L. Kelsall. This crop, of the variety Kondut, was calculated to yield 40 bushels per acre. It was sown (on old land which originally carried York gum), during the first week in May using 48lb. of seed and 92lb. of super per acre. The paddock had been ploughed in July with a mouldboard plough to a depth of 3½in. to 4in. and was spring-tyne cultivated in September and disk cultivated in May prior to seeding. Some bad patches of take-all were

ZONE 1.

Field Judge—G. H. Neil, Agricultural Adviser.

Name.	Address.	Variety.	Yield.	Freedom from Admixture.	Freedom from Disease.	Baking Strength.	Total.
N. F. Hyde & Sons	Waddi Forest	Wongoondy	39	9	9	29	86
H. L. Kelsall	Moora	Kondut	40	8	7	29	84
A. J. Young	Three Springs	Bungulla	40	7	9	25	81
A. & G. H. Broad	Three Springs	Gabo	33	8	9	30	80
B. L. House & Co.	Watheroo	Kondut	36	8	8	28	80
E. Smart	Mingenew	Bungulla	37	9	9	25	80
C. Rayner	Carnamah	Bungulla	36	8	8	26	78
Sharp & Son	Carnamah	Bungulla	32	8	9	26	75
R. F. White	Miling	Bungulla	29	7	9	25	70
C. H. Gronow	Waddi Forest	Kondut	38	8	8	....	*
F. Wooton	Waddi Forest	Kondut	37	9	8	....	*
T. Morcombe	Waddi Forest	Kondut	36	9	8	....	*

* Baking strength of flour below minimum strength figure of 5 minutes.

ZONE 1.—CULTURAL DETAILS.

Competitor	Hyde, N. F. & Sons.	Kelsall, H. L.	Young, A. J.	Broad, A. & G. H.	House, B. L. & Co.	Smart, E.
Original Vegetation	Salmon and Gimlet	York Gum	Salmon Gum	York Gum	Salmon and Gimlet	York Gum and Jam
Years Cleared	Old land	Old land	Old land	Old land	Old land	Old land
Rotation	Fallow, crop, pasture, pasture	No crop for 10 years	Not cropped for a long time	Fallow, crop, oats, pasture	4 years pasture, fallow, crop	Fallow, crop, pasture
Ploughed	June, 1950	July	Aug.	July	Aug.	July
Condition of Land	Good	Good	Dry	Too dry	Good	Good
Implement	Disc	Mouldboard	Disc	Scarifier	Mouldboard	Disc
Depth	3in.	3½in. to 4in.	3½in.	3in. to 4in.	3½in.	3in.
Subsequent Cultivations	Disc cultivated Aug.	Spring tyne cultivated Sept., disc cultivated May	Scarified Sept., Oct., Apl.	Disc cultivated Oct., scarified Jan.	Combine cultivated Sept. and Jan.	Combine cultivated Sept.-May
Planted	3rd week May	1st week May	4th week May	4th week May	2nd week May	last week May
Rate of Seed	60lb.	48lb.	50lb.	60lb.	43lb.	65lb.
Rate of Super	112lb.	92lb.	90lb.	72lb.	112lb.	90lb.
Disease		Take-all			Take-all	
Variety	Wongoondy	Kondut	Bungulla	Gabo	Kondut	Bungulla

Competitor	Rayner, C.	Sharp & Son.	White, R. F.	Gronow, C. H.	Wooton, G.	Morcombe, J.
Original Vegetation	Salmon Gum, York Gum	York Gum	Jam, York Gum	Salmon Gum, Gimlet	Salmon Gum, Gimlet	Salmon Gum, Gimlet
Years Cleared	Old land	Old land	Old clover land	Old land	Old land	Old land
Rotation	Fallow, crop	Crop, pasture, pasture	Not cropped since 1946	Fallow, crop, pasture, pasture	Crop, pasture, pasture, peas	Oats, pasture, fallow, crop
Ploughed	Aug.	Early May, 1951	May, 1951	June	Apl., 1951	June
Condition of Land	Good	Good	Good	Good	Good	Good
Implement	Disc	Scarifier	Disc	Scarifier	Scarifier	Scarifier
Depth	3in.	3in. to 4in.	3in.	3in.		3in.
Subsequent Cultivations	Scarified Apl., May	Disc cultivated mid-May	Disc cultivated June	Scarified Aug., disc cultivated May		Disc cultivated Sept., harrowed Feb., scarified Feb., harrowed Apl.
Planted	End May	4th week May	1st week June	Mid-May	1st week June	1st week May
Rate of Seed	60lb.	47lb.	55lb.	65lb.	60lb.	60lb.
Rate of Super	90lb.	100lb.	90lb.	120lb.	95lb.	112lb.
Disease	Take-all			Slight rust	Slight rust	Rust
Variety	Bungulla	Bungulla	Bungulla	Kondut	Kondut	Kondut

found in the crop together with some admixture.

The average for all crops judged in this zone was 35.4 bushels (range 28-40) per acre, a good season being experienced.

The rainfall data for the centres concerned for 1951 is as follows:—

ZONE 1.—RAINFALL DATA.

	Jan.	Feb.	Mar.	Apl.	Growing Period.							Nov.	Dec.	Total for Year.
					May.	June.	July.	Aug.	Sept.	Oct.	Total.			
Waddi Forrest	137	154	22	314	77	283	258	176	143	40	977	....	51	1,655
Moora	9	75	7	378	128	375	253	180	67	60	1,063	46	139	1,717
Three Springs	94	118	9	295	87	563	338	158	179	55	1,380	5	57	1,958
Watheroo	104	111	7	377	149	385	319	164	94	47	1,158	25	134	1,916
Mingenew	51	65	9	275	126	622	321	178	157	78	1,482	2	38	1,922
Carnamah	117	126	19	215	84	502	278	136	187	44	1,231	9	152	1,869
Miling	30	71	2	219	128	365	216	173	107	68	1,057	3	209	1,591

The seasonal conditions in this zone were good, the season opening in April when well above average falls were recorded. Throughout the growing period satisfactory rains were received, those for both June and July being above average. Though October recordings were below average most crops finished satisfactorily.

ZONE 2

The crop submitted by Mr. L. Carter of Morawa besides winning this zone, gained second place in the State cham-

pionship. His crop of Bungulla, was calculated to yield 45 bushels per acre. This crop was planted on country that had originally carried York gum, Jam and Salmon gum and had not been cropped for at least seven years. The crop was very dense, well stooled, but rather uneven and had lodged in places. A trace of rust was found with some small patches of take-all. The crop was

ZONE 2.

Field Judge—J. A. C. Smith, Agricultural Adviser.

Twelve entries were received in this Zone and of these, nine were inspected. Points were awarded as follows :—

Name.	Address.	Variety.	Yield.	Freedom from Admixture.	Freedom from Disease.	Baking Strength.	Total.
L. Carter	Morawa	Bungulla	45	9	8	25	87
N. F. Hyde & Sons	Latham	Wongoondy	36	9	9	26	80
O. J. Butcher & Son	Pithara	Wongoondy	32	9	9	27	77
G. R. Bartlett	Perenjori	Bungulla	31	9	8	25	73
G. B. Hebiton	Mendel	Bungulla	28	9	9	26	72
D. S. Hebiton & Sons	Wongoondy	Bungulla	29	9	8	25	71
M. L. Davies	Dalwallinu	Bungulla	34	8	9	....	*
E. G. Heitman	Morawa	Bungulla	32	9	8	....	*
S. G. Cole	Morawa	Kondut	31	8	9	....	*

* Baking strength of flour below minimum strength figure of 5 minutes.

ZONE 2.—CULTURAL DETAILS.

Competitor	L. Carter.	Hyde, N. F. & Sons.	Butcher, O. J. & Sons.	Bartlet, G. R.
Original Vegetation	York Gum, Jam and Salmon Gum	Salmon Gum and Gimlet	Salmon Gum and Gimlet	Salmon, Gimlet and York Gum
Years Cleared	Old land	30 years	27 years	3 years
Rotation	Not cropped for at least 7 years	Fallow, wheat, pasture	Fallow, wheat, oats, pasture	Fallow, wheat, pasture
Ploughed	August	August	July	July
Condition of Land	Ideal	Hard	Ideal	Ideal
Implement	Disc	Scarifier	Disc	Disc
Depth	4 in.	2 in. to 3 in.	3 in. to 4 in.	5 in.
Subsequent Cultivations	Scarified Sept., Apr. 51, May, 51. Harrowed after planting in June	Cultivated Sep- Harrowed Jan., 51, Cultivated Feb., Harrowed after planting in May	Scarified Sept., Cultivated Apr., May	Ploughed back Aug., Cultivated Apr., 51
Planted	Mid June	1st week May	2nd week May	Early May
Rate of Seed	40 lb.	60 lb.	49 lb.	45 lb.
Rate of Super	90 lb.	112 lb.	113 lb.	70 lb.
Disease	Slight infection of rust			Take-all
Variety	Bungulla	Wongoondy	Wongoondy	Bungulla

Competitor	Hebiton, G. B.	Hebiton, D. S. & Sons.	Davies, M. L.	Heitman, E. G.	Cole, S. G.
Original Vegetation	Salmon Gum	Salmon Gum and Jam	Salmon Gum, Gimlet, Morrel, Ti-tree	Salmon Gum and Morrel	Salmon Gum
Years Cleared	Over 20 years	Over 20 years	40 years	40 years	30 years
Rotation	Fallow, wheat, wheat, oats, pasture, pasture	Fallow, wheat, wheat, pasture, oats	Fallow, wheat, pasture	Fallow, wheat, wheat, pasture	Fallow, wheat, pasture
Ploughed	Apr., 1951		June, 1950	April, 1951	July
Condition of Land	Very dry		Good	Dry	Good
Implement	Disc	Sunder seeder	Scarifier	Disc	Disc
Depth	3 in. to 4 in.		3 in.	2½ in. to 3 in.	3 in.
Subsequent Cultivation		Harrowed in June after planting	Scarified Aug., Apr., 51. Harrowed with planting	Harrowed with planting	Disced Sept., Cultivated late April, 1951
Planted	Mid-May	Late May	Mid-May	1st week June	End of Apr, beginning of May
Rate of Seed	60 lb	60 lb.	45 lb.	45 lb.	52 lb.
Rate of Super	90 lb.	112 lb.	90 lb.	90 lb.	107 lb
Disease		Slight infection of rust		Slight infection of rust	
Variety	Bungulla	Bungulla	Bungulla	Bungulla	Kondut

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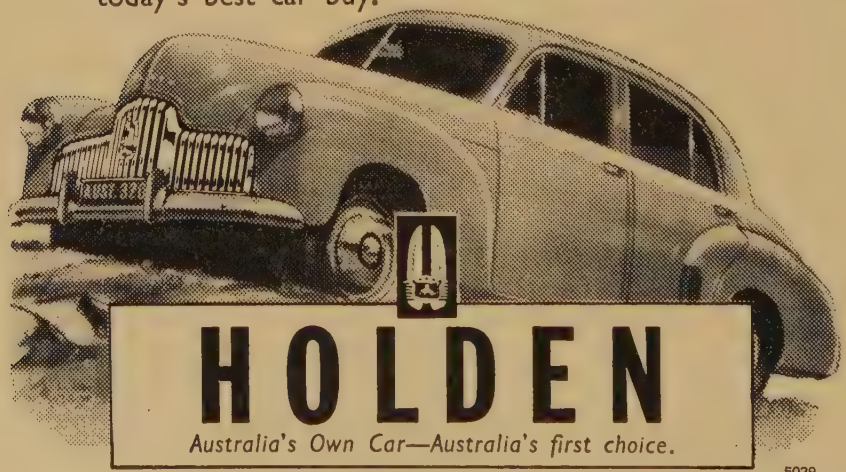

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sown in early June with 40lb. of seed and 90lb. of super per acre. Several days after seeding, the ground was harrowed.

Second in this zone was the entry of Messrs. N. F. Hyde and Sons, being a crop of Wongoondy calculated to yield 36 bushels per acre. The crop was planted in early May, the seed being sown at 60lb. and super at 112lb. per acre. The country (which originally carried Salmon gum and Gimlet) had been cleared for 30 years and grown nine crops on a three year rotation. The land was fallowed with a scarifier in August and cultivated in September and February.

In this zone three entries failed to qualify because the baking strength of the flour was below the minimum strength figure of five minutes.

The rainfall data for the centres concerned for 1951 is as follows:—

ZONE 2.—RAINFALL DATA.

	Jan.	Feb.	Mar.	Apl.	Growing Period.							Nov.	Dec.	Total for Year.
					May.	June.	July.	Aug.	Sept.	Oct.	Total.			
Morawa	75	71	56	214	51	496	353	113	125	35	1,173	16	61	1,666
Latham	84	132	23	236	40	453	291	129	64	42	1,019	2	32	1,528
Pithara	38	102	....	261	75	419	192	168	68	50	972	9	54	1,436
Perenjori	160	108	....	192	39	435	344	90	73	21	1,002	....	31	1,493
Mullewa	85	172	2	317	119	402	311	135	60	23	1,050	1	125	1,752
Dalwallinu	70	138	14	203	90	479	217	167	37	43	1,033	5	92	1,555

The season was not an ideal one although it started off well with good falls in April and heavy rains in June and July. The falls in August, September and October were below average, preventing some crops from finishing well. Weed control was excellent due to the rains in January and later, those in April.

Despite difficult periods during the season, yields from the crops judged in this zone were highly meritorious, the average yield was 33.1 bushels per acre ranging from 28-45 bushels per acre.

ZONE 3

In this zone 11 entries were received by the Royal Agricultural Society and of these, eight were submitted to the judge for inspection. Included in this zone also were the first and second place-getters in the Wyalkatchem Agricultural Society Competition (12 entries were received and seven crops judged). Altogether a total of 15 crops were inspected in order to determine the awards for this zone.

The winning entry was a crop of the variety Kondut grown by Mr. C. J. Halligan. This crop, in addition to gaining first prize in the zone, was awarded first prize in the State championship. The land on which the crop was grown originally carried York gum and Jam and had been cleared for 18 years. About eight years ago the paddock was sown to subterranean clover and Wimmera ryegrass, the rotation since practised on

ZONE 3.

Field Judge—J. A. C. Smith, Agricultural Adviser.

Name.	Address.	Variety.	Yield.	Freedom from Admixture.	Freedom from Disease.	Baking Strength	Total.
C. J. Halligan	Waddington	Kondut	43	9	9	29	90
Davies Bros.	Benjaberring	Bencubbin	39	9	9	25	82
P. E. & M. Cousins	Ballidu	Kondut	31	9	9	25	74
Elsegood & Sons	Wyalkatchem	Bencubbin	30	9	9	25	73
Pearson & Stewart	Wongan Hills	Wongoondy	25	9	9	30	73
W. H. Lines	Ballidu	Bungulla	28	9	9	25	71
T. J. Ward & Sons	Ejanding	Bungulla	28	8	9	25	70
J. H. Webb	Dowerin	Bungulla	25	8	8	26	67
Giblett & Knapp	Ballidu	Bencubbin	28	9	7	....	*
W. G. Shattock	Kondut	Bungulla	21	9	9	....	*

* Baking strength of flour below minimum strength figure of 5 minutes.

ZONE 3.—CULTURAL DETAILS.

Competitor	Halligan, C. J.	Davies Bros.	Cousins, P. E. & M.	Elsegood & Sons.	Pearson & Stewart.
Original Vegetation	York Gum, Jam	Gimlet	Morrel, Salmon Gum	Gimlet	Morrel, Salmon Gum and Gimlet
Years Cleared	18 years	12 years	....	42 years	30 years
Rotation	Crop, pasture, pasture, pasture	Fallow, wheat, pasture	Fallow, wheat, pasture	Fallow, wheat, pasture	Fallow, wheat, pasture
Ploughed	Apl., 1951	July	July	Feb., 1951	March, 1951
Condition of Land	Good	Sticky	Very good	Good	Good
Implement	Disc	Scarifier	Disc	Scarifier	Disc
Depth	2¾in. to 3in.	4in to 5in.	3in.	4in. to 5in.	3in.
Subsequent Cultivation	Harrowed with planting	Scarified Sept., Apl., harrowed with planting	Ploughed Sept., Apl., harrowed with planting	Ploughed May, harrowed with planting	
Planted	Last week Apl.	Early May	Mid-May	2nd week May	End of May
Rate of Seed	56lb.	45lb.	35lb.	45lb.	45lb.
Rate of Super	70lb.	90lb.	112lb.	85lb.	90lb.
Disease	Slight septoria	Very slight rust			
Variety	Kondut	Bencubbin	Kondut	Bencubbin	Wongoondy

Competitor	Lines, W. H.	Ward, T. J. & Sons.	Webb, J. H.	Giblett & Knapp.	Shattock, W. G.
Original Vegetation	Salmon Gum, Gimlet, York Gum	Gimlet, Mallee, Titree	York Gum, Mallee	York Gum, Gimlet	Salmon Gum, Gimlet, Mallee
Years Cleared	35 years	40 years	15 years	14 years	
Rotation	Fallow, wheat, pasture	Fallow, wheat, pasture, pasture	Fallow, wheat, pasture	Fallow, wheat, pasture	Fallow, wheat, pasture
Ploughed	Aug.	July	Apl., 1951	Oct.	June, 1950
Condition of Land	Good	Very good	Good	Fair	Good
Implement	Scarifier	Mouldboard	Scarifier	Disc	Disc
Depth	4in. to 5in.	3in. to 4in.	5in.	4in.	3in. to 4in.
Subsequent Cultivation	Scarified late Aug., Sept., Oct., harrowed Feb., scarified Apl., harrowed May after planting	Disc cultivated Oct. cultivated Apl.	Cultivated Apl.	Cultivated Apl.	Scarified Sept., Nov., harrowed March, cultivated May
Planted	1st and 2nd week May	Early May	1st week May	1st week May	2nd week May
Rate of Seed	58lb.	52lb.	60lb.	45lb.	60lb.
Rate of Super	95lb.	112lb.	120lb.	90lb.	120lb.
Disease	....	....	Take-all	Stem rust	
Variety	Bungulla	Bungulla	Bungulla	Bencubbin	Bungulla

this farm being pasture, pasture, pasture, crop. The area was ploughed with a disk cultivating plough in the beginning of April and planted with a combine in the last week of May with 56lb. of seed and 70lb. of superphosphate per acre. The crop was calculated to yield 43 bushels per acre. It was well-grown, tall and free from any admixture, but had a slight trace of septoria.

Messrs. Davies Bros. were successful in gaining second place with a crop of Bencubbin calculated to yield 39 bushels per acre. This crop was well-known, dense and free from any admixture. The original vegetation was Gimlet being cleared 12 years ago and the land has grown five crops to date. It had been fallowed in July to a depth of 4in. to 5in. with a scarifier, the soil being in a fairly sticky condition. It was scarified again in September and April and planted in the first week in May in semi-dry conditions. The rate of seed and super was 45lb. and 90lb. per acre respectively.

The rainfall data for the centres concerned for 1951 is as follows:—

ZONE 3.—RAINFALL DATA.

	Jan.	Feb.	Mar.	Apl.	Growing Period.							Nov.	Dec.	Total for Year.
					May.	June.	July.	Aug.	Sept.	Oct.	Total.			
Walebing	69	86	11	404	152	418	283	246	98	66	1,263	61	167	2,061
Ballidu	32	132	2	270	116	342	234	116	101	50	959	5	40	1,440
Wyalkatchem	65	136	18	289	91	310	181	97	42	51	772	61	87	1,428
Wongan Hills	159	72	5	239	128	336	214	169	79	39	965	71	58	1,569
Dowerin	135	71	10	273	111	340	169	114	76	45	855	47	65	1,456
Kondut	33	106	7	319	167	323	206	152	93	27	968	33	50	1,516

The season generally was satisfactory although falls in September and October were below average and did not permit of ideal finishing conditions. Most crops were planted under good conditions, weed control being excellent. A trace of rust was detected in some crops but on no occasion was the incidence very serious.

The range of crop yields was wide, yields of 21 bushels to 43 bushels being obtained. An average yield of 27.3 bushels per acre was calculated for this zone.

ZONE 4

The number of entries for this zone was four, all of which were actually judged. Unfortunately owing to misadventure, no entries were received from the Mount Marshall Agricultural Society which usually enters the winners of the local competition in this zone.

ZONE 4.

Field Judge—H. G. Cariss, Agricultural Adviser.

Name.	Address.	Variety.	Yield.	Freedom from Admixture.	Freedom from Disease.	Baking Strength.	Total.
H. Creagh & Sons	Nungarin	Wongoondy	29	9	9	27	74
W. Hull	Yelbeni	Bencubbin	31	8	8	26	73
J. A. O'Leary	Walgoolan	Bungulla	28	9	9	26	72
K. J. & C. J. O'Leary	Walgoolan	Bungulla	25	9	9	25	68

ZONE 4.—CULTURAL DETAILS.

Competitor	Creagh, H. & Sons.	W. Hull.	O'Leary, J. A.	O'Leary, K. J. & C. J.
Original Vegitation	Mallee-Jam, Salmon Gum and Gimlet	Mallee, Salmon Gum	Mallee and Gimlet	Gimlet and Salmon Gum
Years Cleared	40 years	37 years	Old land	28 years
Rotation	3 years	3 years	1st crop for 18 years	3 years
Ploughed	Last week in July	June-July	July	July
Condition of Land	Fair	Good	Good	Good
Implement	Disc cultivating	Disc	Scarifier	Disc cultivating
Depth	3 in to 4 in.	4 in.	3 in.	3 in.
Subsequent Cultivation	Scarified late Sept., March, Apr., May	Scarified Sept., cultivated with a rigid tyne combine in Feb.		Ploughed back Aug., Apr.
Planted	12th to 14th May	1st week May	1st-2nd week in May	3rd week May
Rate of Seed	45 lb.	45 lb.	39 lb.	39 lb.
Rate of Super	90 lb.	90 lb.	70 lb	70 lb.
Disease		Rust		
Variety	Wongoondy	Bencubbin	Bungulla	Bungulla

The winner was Messrs. H. Creagh & Son with a crop of Wongoondy calculated to yield 29 bushels per acre. This crop was planted during the second week in May with a spring-tyne combine using 45lb. of seed and 90lb. of super per acre. The land, which had been cultivated for 40 years under a three-year rotation, had originally carried Mallee, Jam, Salmon gum and Gimlet. The paddock had been ploughed during the last week in July with a disk cultivating plough to a depth of 3in. to 4in. It had then been scarified, about the end of October and later in March, April after rains, and again in May prior to seeding. No disease or admixture was found in the crop, although a crop of Bencubbin adjoining the entry was showing some incidence of stem rust.

Second place was awarded to Mr. W. Hull, with a crop of Bencubbin calculated to yield 31 bushels per acre. This land, which had been cleared since 1914, had carried five or six crops since 1933, at present a three-year rotation is being practised. Planting was commenced in the first week in May with a rigid-tyne

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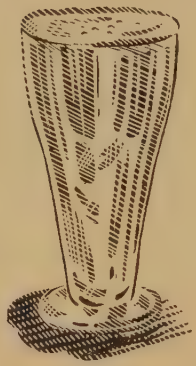

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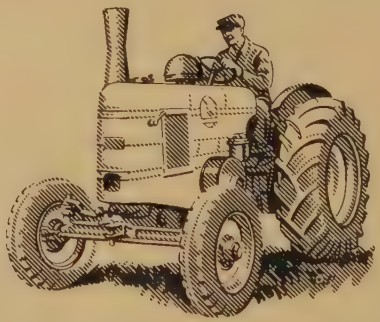

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combine using 45lb. of seed and 90lb. of super. The crop, which was reasonably tall and generally uniform, except for a few weak patches on the light soil, showed some incidence of stem rust particularly on the lighter soil where maturity had been delayed.

Details regarding the rainfall during 1951 at the centres concerned are as follows:—

ZONE 4.—RAINFALL DATA.

	Jan.	Feb.	Mar.	Apl.	Growing Period.							Nov.	Dec.	Total for Year.
					May.	June.	July.	Aug.	Sept.	Oct.	Total.			
Nungarin	98	259	21	252	95	226	185	110	21	31	668	18	193	1,509
Trayning	87	231	29	180	73	287	214	122	41	25	762	2	90	1,381
Walgoolan	81	180	25	156	59	252	124	79	61	24	599	32	123	1,196

Seasonal conditions were not good, although heavy falls were received in January, February and April. After the April falls the season opened reasonably well, the falls of May being below average. Up till the end of August, the crops made satisfactory progress, but the very dry conditions experienced during September and October brought the season to an early close. Most crops showed the effect of this dry period.

In this zone yields ranged from 25-31 bushels per acre and averaged about 28.3 bushels per acre.

ZONE 5

Seven entries were received by the Royal Agricultural Society for this zone, five being judged. The Bruce Rock Agricultural Society also entered the

ZONE 5.

Field Judge—H. G. Cariss, Agricultural Adviser.

Name.	Address.	Variety.	Yield.	Freedom from Admixture.	Freedom from Disease.	Baking Strength.	Total.
F. Dunwell	Narembeen	Kondut	40	9	8	26	83
D. Dunwell	Narembeen	Bencubbin	36	9	8	25	78
P. Strange	Yarding	Wongoondy	33	7	9	27	76
A. W. Latham	Narembeen	Kondut	28	8	8	30	74
T. E. Perry	Belka	Bencubbin	31	9	9	25	74
H. S. York & Son	Tammin	Bungulla	29	9	9	27	74
P. J. Bray	Narembeen	Bungulla	23	9	9	25	66

ZONE 5.—CULTURAL DETAILS.

Competitor	Dunwell, F.	Dunwell, D.	Strange, P.	Latham, A. W.	Perry, T. E.	York, H. S. and Son.	Bray, P. J.
Original Vegetation	Gimlet, mallee, Salmon, ti-tree	Gimlet, salmon gum, blackbutt, sandplain	Gimlet, Salmon, mallee	Gimlet, salmon, morrel	Salmon gum and gimlet	Salmon gum and gimlet	Salmon Gum
Years Cleared	20 years	20 years	25 years	26 years	38 years	40 years	25 years
Rotation	3 year	3 year	5 year now, 4 year previously	3 year	3 year	3 year	4 year
Ploughed	July	July	June	June-July	August	June-July	August
Condition of Land	Good			Good			Good
Implement	Mouldboard	Mouldboard	Scarifier	Mouldboard	Disc	Scarifier	Scarifier
Depth	2½ in. to 3 in.	2½ in. to 3 in.	3 in.	3½ in.	3 in.	3 in.	3 in.
Subsequent Cultivations	Scarified and Harrowed in Oct. Spring tyne cult. in Mar. and April	Scarified and Harrowed in Oct. Spring tyne cult. in Mar. and April	Scarified Sept., October. Ploughed back Feb. Scarified April	Spring tyne cultivated Sept. - Oct. Spring tyne cultivated in Mid - April	Scarified Sept., March	Disc ploughed Aug. Spring tyne cultivated in Mid - April Mid - April	Scarified twice in Sep. Oct. Disc cultivated in Feb - Mar Scarified in May
Planted	Last week Apr.	Last week Apr.	1st week May	Mid-May	1st week May	End May	2nd week June
Rate of Seed	40 lb.	40 lb.	50 lb.	45 lb.	50 lb.	60 lb.	45 lb.
Rate of Super	90 lb.	90 lb.	112 lb	90 lb.	100 lb.	90 lb.	90 lb.
Disease	Very slight rust	Slight rust		Slight rust			
Variety	Kondut	Bencubbin	Wongoondy	Kondut	Bencubbin	Bungulla	Bungulla

first and second place-getters of their competition in this zone. This society received 12 entries and of these ten were inspected. To determine the awards for this zone, therefore, 15 crops were actually judged.

First prize in this zone was awarded to Mr. F. Dunwell with a crop of Kondut calculated to yield 40 bushels per acre. It was sown during the last week in April, using 40lb. of seed and 90lb. of super per acre with a spring-tyne combine. The land had been under cultivation for 20 years using a three-year rotation, and originally carried Gimlet, Salmon gum, Mallee and Ti-tree. It was ploughed during July with a mouldboard plough to a depth of 2½ to 3in. under good conditions; subsequent cultivations had consisted of scarifying and harrowing during October, followed by spring-tyne cultivation during March and April. The crop was well-grown and except for a few weak patches, reasonably uniform and solid. It was free from admixture but had a slight trace of rust.

The crop of Mr. D. Dunwell which was successful in gaining second place, was a crop of Bencubbin calculated to yield 36 bushels per acre. It was sown on land which had mainly carried Gimlet, Salmon gum, Blackbutt and some scrub with a small area of light land and had been under cultivation on a three-year rotation for 20 years. The initial ploughing had been carried out with a mouldboard plough to a depth of 2½ to 3in. under good conditions, and subsequent cultivation had consisted of a scarifying and harrowing during October, followed by spring-tyne cultivations during March and April. The crop was well-grown and reasonably uniform but showing a trace of rust.

Rainfall figures during 1951 for the centres concerned are as follows:—

ZONE 5.—RAINFALL DATA.

	Jan.	Feb.	Mar.	Apl.	Growing Period.							Nov.	Dec.	Total for Year.
					May.	June.	July.	Aug.	Sept.	Oct.	Total.			
Narembeen	80	360	39	171	53	303	136	114	49	26	681	27	272	1,630
Bruce Rock	167	379	7	244	70	315	147	133	40	41	746	34	118	1,695
Tammin	87	144	28	311	60	368	129	110	29	38	734	29	54	1,387

Seasonal conditions were somewhat similar to those experienced in Zone 4. September and October were very dry and only fair finishing conditions were experienced. Even though the season finished rather unsatisfactorily, the average for all crops in this zone was 30.8 bushels per acre ranging from 22-40 bushels per acre.

ZONE 6

In this zone there were originally ten entries, two of these however did not comply with the conditions of the competition and one was withdrawn, seven crops being actually judged.

The winner in this zone was Mr. E. H. Wright with a crop of Kendee calculated to yield 39 bushels per acre. It was planted in mid-May with a spring-tyne combine, using 60lb. of seed and 100lb. of super per acre. The area had been cultivated for about 30 years and fairly heavily cropped prior to 1940, the last crop prior to the present one being sown in 1943. The land, which had originally carried White gum, Morrel with some Mallet, had been ploughed in July with a mouldboard to a depth of 3 to 4in. under good conditions, spring tyne cultivated in October and in early May, prior to seeding. The crop was well-grown and had stood up to the stormy conditions very well and except for very few weak patches, was uniform and solid. It was also very free from disease and admixture.

The competitor gaining second place was Mr. W. B. Stewart with a crop of Wongoondy calculated to yield 38 bushels

ZONE 6.

Field Judge—H. G. Cariss, Agricultural Adviser.

Name.	Address.	Variety.	Yield.	Freedom from Admixture.	Freedom from Disease.	Baking Strength.	Total.
E. H. Wright	Gnowangerup	Kendee	39	9	9	26	83
W. B. Stewart	Borden	Wongoondy	38	9	9	26	82
A. W. Rout	Borden	Wongoondy	44	9	9	....	*
W. J. Kean	Gnowangerup	Bencubbin	35	9	9	....	*
G. E. P. Wellard	Gnowangerup	Bencubbin	33	9	9	....	*
G. R. Moir	Borden	Wongoondy	30	9	9	....	*
W. G. Blackall	Katanning	Kondut	25	9	8	....	*

* Baking strenth of flour below minimum strength figure of 5 minutes

ZONE 6.—CULTURAL DETAILS.

Competitor	Wright, E. H.	Stewart, W. B.	Rout, A. W.	Kean, W. J.	Wellard, G. E. P.	Moir, G. R.	Blackall, W. G.
Original Vegetation	White Gum, Morrel, Mallet	York Gum, Morrel, Mort	York Gum	York Gum, Jam, Yate	Salmon Gum	York Gum, Morrel	White Gum, Jam, Salmon Gum
Years Cleared	30 years	Old land	13 years	Old land	Old land	30 years	Over 40 years
Rotation	Heavily cropped prior to 1940. Last crop in 1943	Lucerne, 5–6 years	5 year	5 year	5 year	Last cropped 6 years ago. Mainly oats grown	Now 3 pasture, 1 wheat and previously 2 pasture, fallow, wheat
Ploughed	July	Aug.	End June	Early July	Aug.	1st week Aug.	End Apl.
Condition of Land	Good	Fairly good	Good	Good	Hard	Good	Good
Implement	Mouldboard	Disc	Scarifier	Skim mouldboard	Disc	Scarifier	Scarifier
Depth	3in. to 4in.	3in. to 4in.	3in.	3¼in.	3½in.	3in.	2in. to 3in.
Subsequent Cultivations	Spring tyne cultivated in Oct., spring tyne, cultivated in early May	Scarified late Sept., Nov, Feb., early May	Disc cultivated 2nd week Oct., scarified Apl., spring tyne cultivated in in 1st week in May	Scarified Sept., Oct., end May, prior to seeding	Disc harrowed Oct., Nov., spring tyne cultivated late March	Scarified Oct., disc cultivated Nov., scarified Feb., disc cultivated prior to seeding	Scarified 3rd week in May
Planted	Mid-May	1st week June	4th week May	End May	2nd and 3rd week May	1st week in June	End May
Rate of Seed	60lb.	60lb.	60lb.	58lb.	50lb.	45lb.	49lb.
Rate of Super	100lb.	112lb.	100lb.	112lb.	90lb.	90lb.	92lb.
Disease							Take-all
Variety	Kendee	Wongoondy	Wongoondy	Bencubbin	Bencubbin	Wongoondy	Kondut

per acre. The crop was sown on old land which had been under lucerne five to six years ago, but only odd plants were evident in the crop. Seeding was carried out during the first week in June, using 60lb. of seed and 112lb. of super per acre. The land, which had originally carried York gum, Morrel and a little Mort had been ploughed with a disk plough during August to a depth of 3 to 4in. under fairly good conditions, it had subsequently received several cultivations, being scarified late September, November, February and early May. It was a good even crop, free from disease and admixture, standing well and very little shedding had occurred.

Rainfall figures during 1951 for the centres concerned are as follows:—

ZONE 6.—RAINFALL DATA.

	Jan.	Feb.	Mar.	Apl.	Growing Period. May.	June.	July.	Aug.	Sept.	Oct.	Total.	Nov.	Dec.	Total for Year.
Gnowangerup	50	104	13	183	123	251	118	130	223	78	923	134	145	1,552
Borden	69	155	12	180	154	343	123	217	241	86	1,164	105	192	1,877
Badgebup	128	141	17	171	155	259	144	149	255	107	1,069	118	276	1,920

The good falls in April, May and June made conditions somewhat difficult for seeding due to waterlogging. Crops, however, made satisfactory growth throughout the latter part of the growing period and finished well. Heavy rains in November caused some damage in some instances.

It was unfortunate that five of the crops judged were below the minimum baking strength figure of five minutes, the exceptionally heavy winter rains possibly being one of the contributing factors to the low strength figures obtained. Yields per acre ranged from 25-44 with an average of 34.9 bushels.

ZONE 7

Originally six entries were received with the Royal Agricultural Society for this zone, but only two remained for judging.

ZONE 7.
Field Judge—L. D. White, Agricultural Adviser.

Name.	Address.	Variety.	Yield.	Freedom from Admixture.	Freedom from Disease.	Baking Strength.	Total.
E. O. Bahr & Son	Kukerin	Gabo	29	9	8	30	76
R. S. Kent	Kukerin	Bencubbin	27	7	9	26	69

ZONE 7.—CULTURAL DETAILS.

Competitor	Bahr, E. O. & Son.	Kent, R. S.
Original Vegetation	York Gum, Salmon Gum and Morrel	Salmon Gum and morrel
Years cleared	Over 30 years	Over 30 years
Rotation	4 year	3 year
Ploughed	July	July
Condition of Land	Fairly Hard	Good
Implement	Disc	Disc cultivating
Depth	4 in.	2½ in.
Subsequent Cultivation	Scarified Oct. Combine end of April	Part cultivated with a rigid tyne combine in Nov. The rest in late April.
Planted....	1st week in May	Mid-May
Rate of Seed	35 lb.	50 lb.
Rate of Super....	90 lb.	105 lb.
Disease	Slight Septoria	
Variety	Gabo	Bencubbin

The entry of Messrs. E. O. Bahr & Son was successful in gaining first prize, being a crop of Gabo calculated to yield 29 bushels per acre. It was grown on land which originally carried York gum, Salmon gum and Morrel and had been cleared for over 30 years. The crop was planted during the first week in May using 35lb. of seed and 90lb. of super. The paddock had been ploughed in July to a depth of 4in. under fairly hard conditions and was subsequently scarified in October and cultivated at the end of April. Some evidence of septoria was found throughout the crop.

Mr. R. S. Kent gained second prize with a crop of Bencubbin calculated to yield 27 bushels per acre. The crop was sown on old land which had originally carried Salmon gum and Morrel. It was planted during mid-May, using 50lb. of seed and 105lb. of super. The ground was first worked in July with a sundercut to a depth of 2½in. under favourable conditions. Part of the paddock was subsequently cultivated back in November, the rest being completed in April. The crop was free from disease, but contained a fair amount of admixture.

Rainfall figures during 1951 for the centres concerned are as follows:—

ZONE 7.—RAINFALL DATA.

	Jan.	Feb.	Mar.	Apl.	Growing Period. May.	June.	July.	Aug.	Sept.	Oct.	Total.	Nov.	Dec.	Total for Year.
Kukerin	95	201	31	266	130	248	157	202	238	165	1,140	31	230	1,994

The season was a very wet one, opening with good falls in April. Good rains were received through the growing period with particularly good finishing rains in September and October. Storms in some districts however caused severe damage and the withdrawal of several crops.

DISCUSSION

The present competition has now been conducted for six seasons and it is therefore appropriate to discuss some of the features associated with the results obtained.

Like other wheat crop competitions of the past, this one promotes healthy competition between farmers who realise that sound methods of crop husbandry are essential if the Championship award is to be won. The lessons to be learnt are therefore of benefit to agriculture as a whole and to wheat farming in particular.

At the same time when the crops are judged, the judge obtains details covering the cultural practices of the crops concerned and from a study of the data for the individual entries, it is possible to assess the reasons for the high or comparatively low yield obtained. Short comments are given on several of the factors concerned.

Yields.—With each year of the competition the yields recorded have been notable for their excellence. The average yield per acre for all zones ranging from 26.1 bushels per acre for 1946 to 31.1 bushels per acre for 1951, with a general average for the six years of 28.8 bushels per acre. Zone average yields have ranged from 22.6 bushels per acre for Zone 4, to 34.5 bushels per acre for Zone 6. In Zone 6 the yields have always exceeded 30 bushels per acre, and Zone 2 has exceeded 30 bushels in every year but 1948.

The highest individual crop yield, 47 bushels per acre, was recorded in 1951.

The yields obtained in this competition are considerably in excess of the long-term State average and do indicate that the State yield per acre could be raised appreciably if every farmer only improved his practices to even a small degree.

Varieties.—With this competition the varieties eligible to compete are stipulated in the rules. At present, these varieties are eleven in number, but in every year, the major proportion of the crops entered have either been Bungulla or Bencubbin. Over the period approximately 50% of the crops were sown to Bungulla, 25% to Bencubbin, 12% to Kondut and 5% to Wongoondy.

From a persusal of the individual zone results and having regard to the quite high percentage of entries from the medium to lower rainfall districts, a high percentage of Bungulla and Bencubbin crops could be anticipated. Both Bencubbin and Bungulla have returned some excellent yields and though it has not achieved a championship the former has won ten zone firsts, and the latter, in addition to winning the Championship in 1946, has won 13 zone competitions.

The late midseason variety Kondut has always performed meritoriously and has now won nine zone competitions as well as the State Championship five times in succession. This variety is particularly useful for the medium to higher rainfall conditions and though it is not rust resistant, is very suitable on account of its good straw strength for seeding on ploughed up clover ley land. Wongoondy, like Kondut, is also of good straw strength and capable of producing flour of good quality and has gained in popularity over the past few years, 15% of the competing crops being sown to this variety in 1951. It is a free stripping variety and has recorded some excellent yields in the State as well as in this competition.

Rotational Practices.—Though in quite a number of cases it has not been possible to determine the long-term rotation practices on the individual properties, a study of the data obtained would indicate that in many cases the rotation has been too short and that too consistent cropping has been reflected not only in the yield but in the quality of the grain. Where a longer rotation has been used of recent years, grain quality in particular has shown a marked improvement.

Flour Quality.—A unique condition of the competition is that points are allotted for the flour quality (baking strength) as determined on the farinograph. Practically every year the strength figures have been of importance in determining both the Championship awards and place-getters in the individual zones.

Perusal of the results show that there has been considerable variation between the years in the number of crops obtaining the maximum, or near maximum, number of points for quality and within the last two seasons in particular, there have been a greater number of crops either not qualifying, or recording low strength figures.

In the results for 1951 in particular, a much larger number of crops failed to qualify than in any previous year, and included one calculated to yield 44 bushels per acre. Having regard to the seasonal conditions it appears that the reason for the low strength figures obtained could be the result of the excessively heavy rains recorded during the early winter period. It should be stressed here that no matter how high the inherent characteristics for strength of the variety, it is not possible for it to produce to its maximum capacity unless seasonal climatic and soil conditions are satisfactory. Each year one or more crops grown on the heavier forest country have also returned low strength figures which can be attributed to the run-down condition of some paddocks due to over cropping, erosion and lack of leguminous pasture species.

Though there has been considerable variation, the results from this competition definitely show that under suitable soil and climatic conditions, together with sound rotational and cultural practices, that the standard recommended W.A. varieties are capable of producing not only high yields but grain of above standard flour quality and satisfactory for local bakers' requirements.

Arrangements have been made for this competition to be again conducted for the 1952-53 season, entries closing with the Royal Agricultural Society on September 12th, 1952.

BACTERIAL CULTURES

PRICE INCREASES ANNOUNCED

PRICES of bacterial cultures prepared by the Department of Agriculture for the inoculation of legume seeds have now been increased. The new prices are 2s. for a 1 oz. bottle; 3s. for a 2 oz. bottle and 7s. 6d. for the 8 oz. size. Old prices were 1s. 6d., 2s. 6d., and 5s. respectively.

Owing to the heavy demand for these cultures it has been found necessary to employ larger laboratory staffs and purchase extra equipment. Postage and materials cost far more today than when the service was inaugurated, and it is felt that a price increase was justified in view of the fact that prices of cultures had previously been unchanged for more than 15 years.

View of well-grown Shiraz vines. In such vines mealy bugs find conditions ideal, and counts of over 90% infested bunches were obtained on untreated plots

THE CONTROL OF MEALY BUG ON VINES IN WESTERN AUSTRALIA

By P. N. FORTE, B.Sc. (Agric.), Senior Entomologist

THE mealy bug (Pseudococcus maritimus Ehr.) was first recorded on vines in Western Australia in 1898 (A. M. Lea, 1898). Since then it has been reported present in certain years in large numbers with consequent loss of quality in the vine products.

The control of the insect was presumed to be accomplished by ladybirds (*Cryptolaemus montrouzieri* Muls.) introduced from Queensland and New South Wales in 1902 (G. Compere, 1902) and lace-wings *(F. Chrysopidae)*. The years of increased mealy bug activity were generally put down to variation in the host—predator population ratio. When troublesome, growers were advised to spray during the dormant period with lime sulphur. The losses caused by a heavy infestation of the insects can be considerable. In the case of currants with a light infestation in the bunches, the fruit is degraded with consequent loss of price or in cases of heavy infestation the currants are rejected and are only useful for distilling to produce alcohol.

In the case of wine grapes, e.g., variety Shiraz, the same thing applies—if the bunch infestation is gross then the grapes are only saleable for distilling which offers a much lower price per ton.

RECENT SURVEYS OF THE PROBLEM

In recent years, numerous complaints of increased mealy bug activity had been received by this Department. Many growers also claimed that they were not achieving control with the present recommendations. It was, therefore, decided to further investigate the control of the pest.

In 1948, therefore, a watch was kept on a number of vineyards on the Swan* to try to find out the status of the mealy

* "The Swan" constitutes the principal vine growing area in the State and includes the following localities—Caversham, Upper Swan, Middle Swan and Baskerville.

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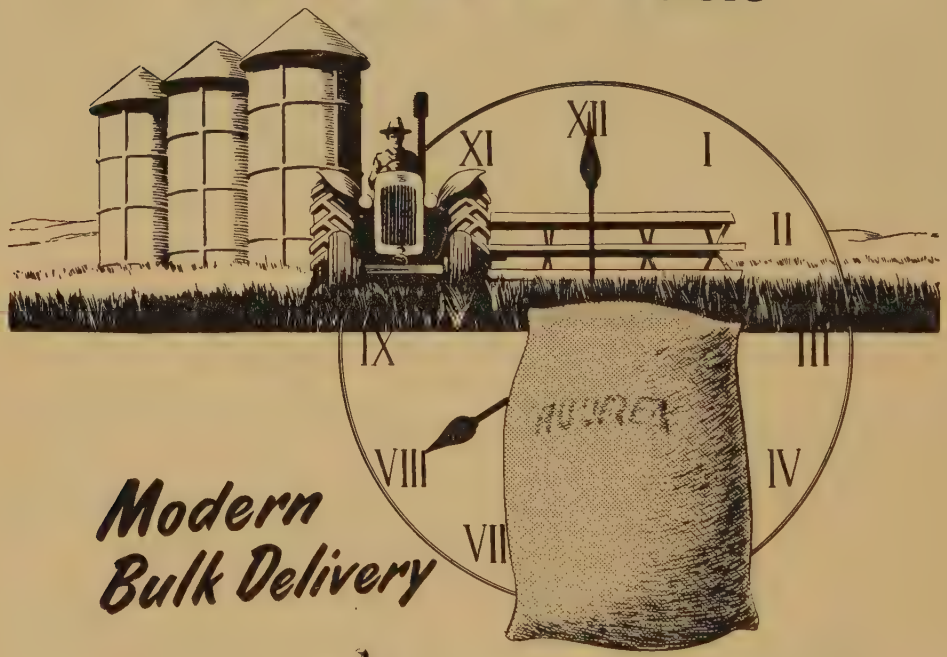

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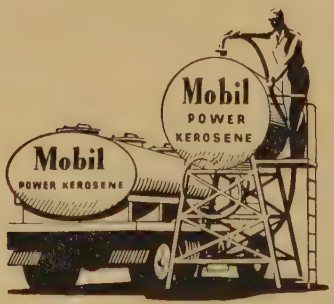

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bug with reference to loss to the industry and the control of the insects. Such items as the over-wintering habits of the mealy bug and actual economic loss to growers were considered important.

Although difficult to detect it was observed that most of the mealy bugs over-wintered on the vines and sheltered under the bark and on the layer next to the sap. It was also observed that the population varied considerably from place to place in a vineyard and, generally speaking, it was difficult to tell at the dormant stage of the vines where mealy bugs would become prevalent during the summer.

FIRST YEAR'S EXPERIMENTS—1949

It was proposed at this stage to test out a number of new insecticides to see if they would control the mealy bug and to compare them with lime sulphur.

Treatments Used: Six insecticides were selected as possibly being useful for controlling mealy bug and initially there appeared to be two periods when it would be useful to apply sprays, viz., at the dormant stage and at the open bunch stage of growth.

The following insecticides and concentrations were used:—

(1) Lime Sulphur—1 part in 7 applied at dormant stage.

(2) Lime Sulphur—1 part in 7 applied at dormant stage, but with all old bark removed from the vine.

(3) 2% DDT emulsion (2% p.p. isomer) applied at the dormant stage.

(4) 1% Benzene-hexachloride emulsion (1% gamma isomer) applied at the dormant stage.

(5) Commercial Sulphuric Acid—1 part in 10 of water, applied at dormant stage.

(6) Control—no treatment.

(7) 0.5% DDT emulsion (0.5% p.p. isomer) applied in the summer.

(8) 0.05% Benzene - hexachloride emulsion (0.05% gamma isomer) applied in the summer.

(9) *Hexone—1 part in 800 parts of water applied in the summer.

(10) †E.605—1 part in 2,400 parts of water applied in the summer.

* Hexone-active ingredient not less than 95% esters of polyphosphoric acid mostly hexaethyltetraphosphate.

† E.605 contains 22.4% Diethylparanitrophenylthiophosphate.

Selection of Sites: As it was evident that mealy bug infestation varied considerably, five areas likely to be infested were chosen in consultation with growers.

It was thought that if the experiments were laid down in these five places there was every chance of one having a good mealy bug population and hence yielding some results. Two of these areas were on the wine grape variety Shiraz and the other three on currants.

Design of Experiment: It seemed reasonable to find out the number of bunches of grapes or currants infested with mealy bug, as these would cause loss by lower price per ton. To use a figure of percentage-infested bunches, it was desirable to have large numbers per plot. The plot size selected, therefore, was six vines as it was expected that such an area would yield about 600 bunches.

The size of the experiment was limited by the manpower available to pick it at harvest time. So a randomised block design was used, having seven replications of 10 treatments.

Time of Application: The winter treatments were applied just prior to bud-burst (September) and the summer ones in December at the "open-bunch" stage of fruit development.

The sprays were applied thoroughly with a commercial spraying plant using 250 lb. per square inch pressure. The exception being Sulphuric Acid, which was applied with a lead-lined knapsack spray.

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Sampling: All the bunches for each plot were picked, examined, and counted and those with mealy bug present were recorded separately. This was found to be easily accomplished by having one person recording and five persons picking. The method was for each person to pick and examine five bunches and then to call out the count, giving the number of infested bunches first, e.g., 0-5, 3-2, 1-4 etc.

This method was rapid and worked very well. The grapes were picked at the usual time for harvesting the variety concerned. In sampling these five experimental sites, 150,000 bunches of grapes were picked.

Results: The results were calculated as percentages of infested bunches. However, on four of the five sites the mealy bug population was so variable that they were not suitable for analysis.

The fifth site (a block of currants) had a reasonably uniform mealy bug population and Table I shows the percentage of infested bunches for each treatment together with the means.

Two bunches of grapes (variety Shiraz) picked at harvest time—one sound bunch and the other showing the result of heavy mealy bug infestation

Inspection of the table shows that one treatment was outstandingly good, i.e., 2% DDT applied just before bud-burst. As this mean (0.11%) is about 40 times less than the next lowest mean, it is highly significant and was not included in the analysis of variance.

An analysis of variance, using Log $(1 + x)$ transformation, was made on the remaining figures and no significant difference was found between any of the treatments.

SECOND YEAR EXPERIMENTS—1950

From the first year's results it became apparent that further work need only include varying concentrations of DDT to establish the lowest concentration to give effective control. However, as a new systemic insecticide was available (Pestox 3H) and it had shown some indications of being useful against mealy bug it was included in the treatments.

Treatments: The following treatments were selected and DDT was also included in the form of water-dispersible powder:—

(1) 4% DDT emulsion applied just before bud burst.

(2) 2% DDT emulsion applied just before bud-burst.

(3) 1% DDT emulsion applied just before bud-burst.

(4) ½% DDT emulsion applied just before bud-burst.

TABLE I.—PERCENTAGES OF INFESTED BUNCHES.

MEALY BUG EXPERIMENT (CURRANTS) 1949–50—W. TAYLOR, CAVERSHAM, W.A.

	Lime Sulphur 1–7	Lime Sulphur 1–7 Barked	2% DDT	1% BHC	Sulphuric Acid 1–10	Control	½% DDT Summer	0·05% BHC Summer	Hexone 1–800 Summer	E.605 1 in 2,400 Summer
					TREATMENTS					
Blocks	1	2	3	4	5	6	7	8	9	10
A	6·22	10·9	0·00	2·45	13·1	3·46	7·56	30·6	9·26	3·15
B	1·85	6·75	0·00	1·46	4·48	5·8	0·00	20·0	3·82	7·27
C	3·29	2·86	0·47	13·40	15·0	18·7	15·38	9·1	19·25	5·24
D	2·44	0·35	0·00	0·76	14·8	1·48	2·58	0·32	5·23	33·0
E	26·4	3·69	0·00	4·62	7·08	9·43	0·28	19·80	5·92	10·40
F	0·29	2·03	0·22	22·35	18·15	15·05	1·38	10·05	6·03	2·5
Total	40·49	26·78	0·69	45·04	71·81	52·42	27·18	80·87	49·51	61·56
Mean	6·75%	4·46%	0·11%	7·50%	11·96%	8·73%	4·53%	13·44%	8·23%	10·26%

(5) 2% DDT water dispersible powder applied just before bud-burst.

(6) *Pestox 3H (3 parts in 400 of water) applied at the open bunch stage.

(7) Control—no treatment.

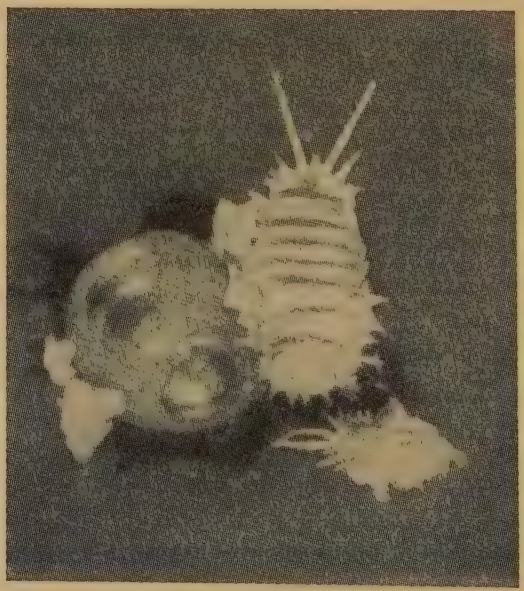
* Pestox 3H contains 60% w/v dimethylamino phosphorus anhydride.

Selection of Site: In the previous year's work it was seen that the mealy bug population variation was much bigger than expected. Whereas in that year the areas chosen were those indicated by growers as mealy bug infested, every effort was made to find and mark a reasonably uniform mealy bug infested area for 1950.

Design of Experiment: This experiment was designed as a randomised block with 12 replications and seven treatments. As the mealy bug population was heaviest on the end vines of a row, it was necessary to run the blocks across the rows. The plot size was once again six vines yielding approximately 600 bunches.

Time of Application: The dormant sprays were applied just before bud-burst with the same plant as used previously. The systemic spray was applied with a knapsack spray in the summer at the open bunch stage. At this time the vines had plenty of new growth showing.

Summer Observations: It was thought worth while to see if mealy bugs were present before the Pestox 3H was applied. Therefore a survey was made by examining the bunches at the open bunch stage. This revealed a heavy infestation on all the plots to be treated



Mealy bug (greatly magnified) feeding on a vine

TABLE II.—PERCENTAGES OF INFESTED BUNCHES.

MEALY BUG EXPERIMENT 1950–51 (VARIETY SHIRAZ)—W. TAYLOR, CAVERSHAM, W.A.

	4% DDT	2% DDT	1% DDT	½% DDT	2% DDT Water Dispersible Powder	Pestox 3H	Control
Blocks	1	2	3	TREATMENTS. 4	5	6	7
A	1·74	1·34	15·14	65·7	47·00	79·80	97·4
B	8·65	0·00	0·39	4·45	3·72	71·1	64·6
C	0·68	0·00	4·44	4·57	4·45	77·1	76·4
D	8·25	0·44	1·84	7·9	16·45	38·3	82·0
E	4·48	0·58	2·46	6·07	10·26	48·6	58·0
F	0·45	0·00	10·89	0·45	4·6	26·95	82·3
G	1·86	3·96	0·00	0·86	0.00	27·5	67·0
H	0·81	0·19	0·39	10·35	2·56	54·1	56·2
J	2·08	1·15	6·12	0·28	6·38	54·3	58·5
K	2·62	0·26	0·00	6·43	10·85	30·4	8·98
L	0·00	0·17	1·12	0·00	0·83	34·7	27·8
N	0·36	0·68	0·00	0·00	0·75	65·7	29·8
Total	31·48	8·77	42·79	107·08	107·91	619·5	708·98
Mean	2·62%	0·73%	3·73%	8·92%	8·99%	51·6%	59·08%

with Pestox 3H. After spraying a close check was kept on these plots for 10 days and no dead or dying mealy bugs were found.

Sampling: The sampling was performed in the way previously described and involved the handling of 42,000 bunches of grapes.

Results: Once again these were calculated as percentage-infested bunches and Table II shows the figures for all treatments. It will be seen that all the DDT treatments were outstanding in their control and that the Pestox 3H was most disappointing.

An analysis of variance was performed on the DDT treatments using a log $(1 + x)$ transformation (Table III). Block A was excluded as apparently some unknown factor intervened.

Table III shows 2% DDT applied just pre bud-burst again to be outstanding for controlling mealy bug on vines on the Swan in Western Australia, although it was not significantly better than 1% DDT applied at the same time.

Further, ½% DDT applied just pre bud-burst, although significantly inferior to 2% DDT, did really reduce the mealy bug population to a very low level.

DISCUSSION

The method of applying the pre bud-burst treatments was to give a thorough application of spray at 250 lb. square inch pressure. When spraying large vines, such as the well grown Shiraz shown in the photograph, this took 150-200 gallons per acre. A lot of spray is wasted as it generally is when spraying deciduous fruit trees in the winter.

It was found that, generally speaking, few growers on the Swan had a good idea of what was meant by a thorough winter spray, but, of course, it is essential to spray thoroughly to hope to achieve control of insect pests during the dormant period of the vines.

Mention should be made of the effect of all the summer applied treatments on the berries. Where the spray touch-

TABLE III.—PERCENTAGES OF INFESTED BUNCHES.

MEALY BUG EXPERIMENT 1950–51 (VARIETY SHIRAZ)—W. TAYLOR, CAVERSHAM, W.A.

FIGURES USED FOR ANALYSIS OF VARIANCE (USING LOG (1+x) TRANSFORMATION).

Blocks	4% DDT	2% DDT	1% DDT	½% DDT	2% DDT Water Dispersible Powder.
	TREATMENTS				
	1	2	3	4	5
B	8·65	0·00	0·39	4·45	3·72
C	0·68	0·00	4·44	4·57	4·45
D	8·25	0·44	1·84	7·9	16.45
E	4·48	0·58	2·46	6·07	10·26
F	0·45	0·00	10·89	0·45	4·6
G	1·86	3·96	0·00	0·86	0·00
H	0·81	0·19	0·39	10·35	2·56
J	2·08	1·15	6·12	0·28	6·38
K	2·62	0·26	0·00	6·43	10·85
L	0·00	0·17	1·12	0·00	0·83
N	0·36	0·68	0·00	0·00	0·75
Total	29·74	7·43	27·65	41·38	60·91
Mean	2·70%	0·67%	2·55%	3·76%	5·53%
Mean (Log (1+x))	0·4519	0·1676	0·3880	0·5222	0·5864

Least significant difference of means at 5% level—0·2674

Least significant difference of means at 1% level—0·3577

ed them they were permanently disfigured and it is unwise to contemplate any spray applications from the period of bunch setting onwards into the summer.

The results show 2% DDT applied just prior to bud-burst to be the best concentration for controlling mealy bug in vines but such good results were obtained with ½% DDT experimentally that a practical test was carried out in 1951 by spraying a block of 2½ acres of vines, variety Shiraz, in early September. Throughout this area mealy bugs were found under the bark at the dormant stage. When the site was harvested it was difficult to find a mealy bug infested bunch of grapes and no economic loss of grapes was experienced in this area.

It is considered, therefore, that the concentration of ½% DDT applied just pre bud-burst is sufficient for general field use and, of course, much cheaper than 2% DDT.

In practice it was found that it is rarely necessary to spray a whole vineyard. The procedure should be to mark the infested areas or individual vines at the time of picking and then these areas can be treated during the winter with DDT spray.

Where mealy bug infested bunches are encountered during picking it is a good plan in the case of currants especially to pick them into separate tins and segregate them on the drying racks.

During the investigations a watch was kept for the mealy bug predators, the ladybirds and lace-wings, and it was found that they appeared wherever mealy bugs were found irrespective of whether the vines had been sprayed with DDT or not.

ACKNOWLEDGMENTS

My thanks are due to Mr. C. F. H. Jenkins (Government Entomologist) who suggested the project and for his continued interest over the years dur-

ing which it was carried out, and also for kindly reading through the manuscript.

I wish gratefully to acknowledge the assistance given by Mr. R. C. Rossiter, Senior Research Officer, Division of Plant Industry, C.S.I.R.O., Western Australia, in the statistical analysis of the results.

I wish to thank Mr. H. Thomas for his co-operation in the first year and also Mr. W. H. Taylor, on whose property almost all the work was carried out. His keen interest and ever ready assistance in the field work was greatly appreciated.

My thanks are also due to those other members of the Entomology Branch of the Department of Agriculture who shared with me the tedious task of sampling the experiments.

SUMMARY

1. Observations have been made on the mealy bug (*Pseudococcus maritimus* Ehr) attacking vines on "the Swan" in Western Australia.

2. The following list of insecticides have been tested at varying concentrations and times of application:—Lime Sulphur, DDT, Benzene-hexachloride (BHC), Commercial Sulphuric Acid, Hexone, E.605, Pestox 3H.

3. Two per cent. DDT emulsion spray applied pre bud-burst was found to give remarkable control of mealy bugs. Whereas none of the other insecticides gave any significant control.

4. For general spraying ½% DDT emulsion applied pre bud-burst will also reduce the mealy bug population to proportions where no economic loss is experienced.

5. General sprays of DDT at ½% strength appeared to have little effect on the principal predators of mealy bugs—the ladybird *(Cryptolaemus montrouzieri* Muls.) and lace-wings *(F. Chrysopidae)*.

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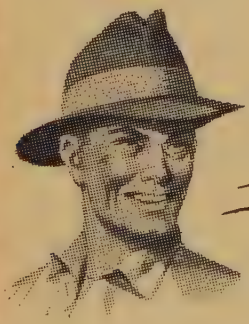
MESQUITE

AERIAL SPRAY TO BE TESTED

AN intensification of the spread of Mesquite in the North-West of the State was reported by the Chief Weed Control Officer of the Department of Agriculture (Mr. G. R. W. Meadly).

He stated that a spineless form of this tree had been introduced on certain North-West stations some years ago as it was thought that the plant would provide valuable topfeed in its highly nutritious pods and beans. Unfortunately, the trees had reverted to the spined type and dense thickets had developed in some areas. Approval was recently given for experiments in aerial spraying of these thickets in an attempt to control the pest by chemical means.



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Experiments with Mineral Oils

By T. G. HANEY, B.Sc. (Agric.), Acting Officer-in-Charge, Tobacco Industry

EXPERIMENTS conducted overseas and elsewhere in Australia have shown that the application of mineral oils to the cut surface of the tobacco stem after topping (removal of the flower head) have reduced the amount of sucker growth of tobacco plants. Previous experience in Western Australia has shown that the most appropriate time for topping of tobacco crops has been after the first leaf has been harvested. This operation has the effect of putting more body and width into the tip leaves, which, without topping, tend to be narrow and comparatively light in weight. With late planted crops, however, crops are generally left untopped, since the topping operation tends to retard the ripening of leaf by several weeks, although, after this period, the leaves ripen more rapidly and evenly.

The main objection to topping tobacco is that the growth of suckers is greatly increased by the operation. These suckers take food from the plant which would normally go into the leaves. Suckering of a tobacco crop is long and tedious, and if labour is employed, is costly.

Another point in favour of topping is that, when the flower petals are mature, they drop and fall on to the leaf. Contact of the petal with the leaf produces conditions conducive to the development of fungi such as Sclerotinia sclerotiorum and Botrytis cinerea, which cause "dead-blossum leafspot." This disease produces large dead spots on the leaves, causing leaf to be placed in a damaged grade and it can also carry through the curing of the leaf causing a mould to develop on the cured leaf while still in the kiln.

Preliminary experiments were conducted at the Manjimup Tobacco Research Station in 1952 to determine the effects of application of several mineral oils on the cut surface of the stem after topping on the development of sucker growth. The oils used were:—

Vacuum White Oil No. 1.
Vacuum White Oil No. 4.
Vacuum Liquid Paraffin.

EXPERIMENTAL DATA AND RESULTS

(1) In the first trial, Vacuum White Oil No. 1 was used. Thirty-two rows of tobacco which had been hilled were selected and all plants which were in flower were topped on the 30th January. All topped plants in every second row were then treated with Vacuum White Oil No. 1, alternate rows being left as controls. The oil was applied at the rate of one teaspoonful (approx. 4cc) per plant. There was a certain amount of waste in this method of application, since approximately half of the oil ran down the outside of the stem and was not absorbed by the stem.

Table I gives the number and dry weight of suckers from each row. After picking, on the 30th March, the suckers were placed in paper-bags and hung in a kiln at 200° F. for three days to completely dry. All suckers over half an inch long were taken and counted.

HORMONES FOR VINES MAY SUPPLANT CINCTURING

SYNTHETIC hormone sprays used experimentally by the Department of Agriculture during the past season may eventually make unnecessary the laborious practice of cincturing vines. Cincturing, which consists of removing a strip of bark from the stem of the vine just after flowering time, is normally essential for the setting and subsequent development of commercial currants.

In experiments conducted by the Chief Plant Research Officer of the Department of Agriculture (Dr. T. C. Dunne) this season, two spray materials, 2,4-D (2,4-dichlorophenoxyacetic acid), at a concentration of 2½ parts per million and P.P.A. (parachlorophenoxyacetic acid), at 20 and 50 parts per million, were used with promising results. It was found that quantities as low as 50 gallons per acre sprayed on the vines were effective and that it was not necessary to concentrate the spray on the bunches to effect satisfactory setting.

It is emphasised that the work is still in the experimental stage and as yet, no recommendations for commercial use can be made. Preparations of the materials used are not available in forms suitable for use by vignerons. As considerable injury and perhaps death of vines can result from such substances being applied in the wrong way, growers are warned against the indiscriminate use of these hormone type materials at questionable concentrations.

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TABLE No. I

TREATED WITH WHITE OIL No. 1

Row Number.	Number of Plants.	Total Number of Suckers.	Total Weight of Suckers in Ounces.	Number of Suckers per plant.	Weight of Suckers per plant in Ounces.
1	16	103	7·0	6·4	0·44
3	16	101	8·5	6·3	0·53
5	12	88	11·0	7·3	0·92
7	16	131	15·5	8·2	0·97
9	14	101	19·0	7·2	1·36
11	14	123	19·5	8·8	1·39
13	5	55	5·5	11·0	1·10
15	6	55	7·5	9·2	1·25
17	10	84	14·5	8·4	1·45
19	11	72	12·0	6·6	1·09
21	14	111	12·5	7·9	0·89
23	11	133	12·0	12·1	1·09
25	16	162	32·5	10·1	2·03
27	13	157	36·5	12·1	2·80
29	16	176	32·0	11·0	2·00
31	11	160	30·0	14·5	2·73
16	201	1,812	275·5	147·1	22·04
Average	....	9	....	....	1·32

CONTROL: TOPPED AND NOT SUCKERED

Row Number	Number of Plants.	Total Number of Suckers.	Total Weight of Suckers in Ounces.	Number of Suckers per Plant.	Weight of Suckers per plant in Ounces.
2	15	100	11·0	6·6	0·73
4	14	96	17·5	6·9	1·25
6	11	80	14·0	7·3	1·27
8	13	108	24·0	8·3	1·85
10	14	119	18·0	8·5	1·29
12	9	60	19·5	6·7	2·17
14	10	75	22·5	7·5	2·25
16	16	116	29·0	7·2	1·81
18	10	66	22·0	6·6	2·20
20	10	78	21·5	7·8	2·15
22	10	83	25·5	8·3	2·55
24	16	145	39·5	9·1	2·47
26	13	125	28·5	9·6	2·19
28	10	77	24·0	7·7	2·40
30	9	80	23·0	8·9	2·56
32	3	22	13·0	7·3	4·33
16	183	1,430	352·5	124·3	33·47
Average	....	8	....	....	1·92

It can be seen from the figures presented in Table I that there was an increase of one in the number of suckers taken from treated and untreated plants, but the average weight of suckers taken from each treated plant was 1.32 oz. compared with 1.92 oz. in the control plants.

TABLE No. II

Treatments.	Number of Plants.	Total Number of Suckers.	Total Weights of Suckers in Ounces.	Number of Suckers per Plant.	Weight of Suckers per Plant in Ounces.
A.—Equal quantities of paraffin + No. 4 oil	38	352	15	9·3	0·40
B.—No. 4 oil	45	557	21·5	12·4	0·48
C.—Paraffin	53	797	35	15·0	0·66
D.—Topped and not suckered.—Control	38	501	31	13·2	0·82

(2) The second trial conducted was to compare the effects of two oils, and a combination of the two as against control. Four rows were selected in one block for each treatment, the treatment being:—

(a) Equal quantities of No. 4 Oil and liquid paraffin.

(b) No. 4 oil alone.

(c) Liquid paraffin alone.

(d) Control: topped and not suckered.

Table No. II gives comparative numbers and dry weights of suckers from the various treatments.

From the figures, it can be readily seen that Treatment (a), using equal quantities of liquid paraffin and No. 4 oil, reduced by half both the number and weight of suckers on each plant, as against the control. There were 15 suckers weighing 0.40 oz. from each plant in the treated rows, whilst the control gave 31 suckers weighing 0.82 oz. No. 4 oil alone was more effective than paraffin, both of which had some effect on reduction of the weight of suckers.

DISCUSSION

The results of these preliminary trials have clearly shown that the application of several oils to the cut surface of the stems after topping tobacco reduced the dry weight of suckers produced.

Further investigations will be undertaken next season, when it is hoped that a device which tops the plants and automatically applies the oil at the same time will be available. This device will prevent the loss of oil involved by the present methods of application and should give more effective control of suckers.

From results obtained to date, it appears that the application of a mixture of equal quantities of White Oil No. 4 and liquid paraffin is the most effective for the prevention of sucker growth of tobacco after topping.

ACKNOWLEDGMENTS

The co-operation and assistance of the Vacuum Oil Coy. Pty. Ltd. is gratefully acknowledged.

SUNRISE AND SUNSET TIMES FOR SEPT.-OCT., 1952

(Supplied by the Government Astronomer)

Times of sunrise and sunset for every fifth day, are given for a number of towns throughout the State. Times for a town not on the list may be estimated if its position in relation to one or more of the listed towns is known. The times given for sunrise are those of the first appearance of the top edge of the sun over a true horizon; those for sunset give the time of the sun's disappearance below a true horizon. Situation in a valley would make the sun appear to rise later, and on a hill it would appear earlier.

SUNRISE

Month.	Day of Month.	Broome.	Port Hedland.	Onslow.	Carnarvon.	Yalgoo.	Geraldton.	Moora.	Kalgoorlie.	Southern Cross.	Merredin.	Perth.	Tammin.	Northam.	Narrogin.	Collie.	Bunbury.	Katanning.	Bridgetown.	Hopetoun.	Esperance.	Cape Leeuwin.	Albany.
Sept....	1	5·59	6·15	6·30	6·37	6·28	6·37	6·33	6·11	6·20	6·24	6·35	6·28	6·31	6·30	6·34	6·36	6·29	6·34	6·19	6·12	6·39	6·28
,, ...	5	5·56	6·12	6·27	6·33	6·23	6·32	6·28	6·6	6·15	6·19	6·30	6·23	6·26	6·25	6·29	6·31	6·24	6·29	6·14	6·7	6·34	6·23
,, ...	10	5·51	6·7	6·22	6·28	6·16	6·27	6·21	5·59	6·6	6·12	6·23	6·16	6·19	6·18	6·22	6·24	6·17	6·22	6·7	6·0	6·27	6·15
,, ...	15	5·47	6·2	6·17	6·22	6·11	6·21	6·15	5·53	6·2	6·6	6·16	6·9	6·12	6·12	6·16	6·18	6·10	6·15	6·0	5·53	6·20	6·8
,, ...	20	5·42	5·57	6·11	6·16	6·5	6·14	6·8	5·46	5·55	5·59	6·9	6·2	6·5	6·4	6·8	6·10	6·2	6·7	5·52	5·45	6·12	6·0
,, ...	25	5·38	5·53	6·7	6·12	5·59	6·8	6·2	5·40	5·49	5·53	6·4	5·56	5·59	5·57	6·1	6·3	5·55	6·0	5·45	5·38	6·5	5·53
,, ...	30	5·34	5·49	6·3	6·7	5·54	6·3	5·57	5·35	5·44	5·48	5·58	5·51	5·54	5·52	5·56	5·58	5·50	5·55	5·40	5·33	6·0	5·48
Oct.	1	5·34	5·48	6·2	6·6	5·53	6·2	5·56	5·34	5·43	5·47	5·56	5·49	5·52	5·51	5·55	5·57	5·48	5·53	5·38	5·31	5·58	5·46
,, ...	5	5·30	5·44	5·57	6·1	5·48	5·56	5·50	5·28	5·35	5·41	5·50	5·43	5·46	5·45	5·49	5·51	5·42	5·47	5·32	5·25	5·52	5·40
,, ...	10	5·27	5·41	5·54	5·57	5·43	5·52	5·44	5·22	5·31	5·35	5·45	5·38	5·41	5·39	5·43	5·45	5·37	5·42	5·27	5·20	5·47	5·34
,, ...	15	5·22	5·36	5·48	5·51	5·37	5·45	5·37	5·15	5·24	5·28	5·37	5·30	5·33	5·32	5·36	5·38	5·29	5·34	5·19	5·12	5·39	5·26
,, ...	20	5·19	5·32	5·44	5·46	5·31	5·39	5·31	5·29	5·18	5·24	5·31	5·24	5·27	5·25	5·29	5·31	5·22	5·27	5·12	5·5	5·32	5·19
,, ...	25	5·16	5·29	5·41	5·43	5·27	5·35	5·27	5·5	5·14	5·18	5·27	5·20	5·23	5·20	5·24	5·26	5·17	5·22	5·7	5·0	5·27	5·14
,, ...	31	5·12	5·25	5·36	5·38	5·22	5·29	5·21	4·59	5·8	5·12	5·20	5·13	5·16	5·14	5·18	5·20	5·10	5·15	5·0	4·53	5·20	5·7

SUNSET

Month.	Day of Month.	Broome.	Port Hedland.	Onslow.	Carnarvon.	Yalgoo.	Geraldton.	Moora.	Kalgoorlie.	Southern Cross.	Merredin.	Perth.	Tammin.	Northam.	Narrogin.	Collie.	Bunbury.	Katanning.	Bridgetown.	Hopetoun.	Esperance.	Cape Leeuwin.	Albany.
Sept....	1	5·43	5·57	6·10	6·13	5·59	6·8	6·0	5·38	5·47	5·51	6·0	5·53	5·56	5·55	5·59	6·1	5·52	5·57	5·42	5·35	6·2	5·49
,, ...	5	5·45	5·59	6·12	6·15	6·1	6·10	6·2	5·40	5·49	5·53	6·3	5·56	5·59	5·57	6·1	6·3	5·55	6·0	5·45	5·38	6·5	5·52
,, ...	10	5·45	5·59	6·12	6·17	6·4	6·12	6·6	5·44	5·53	5·57	6·6	5·59	6·2	6·1	6·5	6·7	5·58	6·3	5·48	5·41	6·8	5·56
,, ...	15	5·46	6·1	6·15	6·19	6·6	6·15	6·9	5·47	5·56	6·0	6·10	6·3	6·6	6·4	6·8	6·10	6·2	6·7	5·52	5·45	6·12	6·0
,, ...	20	5·46	6·1	6·15	6·20	6·8	6·17	6·11	5·49	5·58	6·2	6·12	6·5	6·8	6·7	6·11	6·13	6·5	6·10	5·55	5·48	6·15	6·8
,, ...	25	5·48	6·3	6·17	6·22	6·11	6·20	6·14	5·52	6·1	6·5	6·15	6·8	6·11	6·11	6·15	6·17	6·9	6·14	5·59	5·52	6·19	6·7
,, ...	30	5·49	6·4	6·19	6·24	6·13	6·23	6·17	5·55	6·4	6·8	6·18	6·11	6·14	6·14	6·18	6·20	6·12	6·17	6·2	5·55	6·22	6·10
Oct.	1	5·48	6·4	6·19	6·24	6·13	6·23	6·17	5·55	6·4	6·8	6·19	6·12	6·15	6·14	6·18	6·20	6·13	6·18	6·3	5·56	6·23	6·11
,, ...	5	5·49	6·4	6·19	6·25	6·15	6·24	6·19	5·57	6·6	6·10	6·21	6·14	6·17	6·16	6·20	6·22	6·15	6·20	6·5	5·58	6·25	6·13
,, ...	10	5·51	6·7	6·22	6·29	6·19	6·28	6·24	6·2	6·11	6·15	6·25	6·18	6·21	6·21	6·25	6·27	6·19	6·24	6·9	6·2	6·29	6·18
,, ...	15	5·52	6·8	6·24	6·31	6·21	6·31	6·27	6·5	6·14	6·18	6·29	6·22	6·25	6·25	6·29	6·31	6·24	6·29	6·14	6·7	6·34	6·23
,, ...	20	5·53	6·10	6·26	6·34	6·24	6·34	6·30	6·8	6·17	6·21	6·32	6·25	6·28	6·29	6·33	6·35	6·28	6·33	6·18	6·11	6·38	6·27
,, ...	25	5·55	6·12	6·28	6·36	6·28	6·38	6·34	6·12	6·21	6·25	6·37	6·30	6·33	6·33	6·37	6·39	6·33	6·38	6·23	6·16	6·43	6·32
,, ...	31	5·57	6·14	6·31	6·39	6·31	6·42	6·39	6·17	6·26	6·30	6·41	6·34	6·37	6·38	6·42	6·44	6·37	6·42	6·27	6·20	6·47	6·37

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